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MEDICAL AND SURGICAL REPORTS

OF THE

CITY HOSPITAL

OF THE

CITY OF BOSTON.

Fourth Series.

EDITED BY

DAVID W. CHEEVER, M.D., OLIVER F. WADSWORTH, M.D., AND
GEORGE B. SHATTUCK, M.D.

BOSTON:
PUBLISHED BY THE TRUSTEES.
1889.

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THE BOSTON CITY HOSPITAL.

Erected 1864. Enlarged 1876 and 1888.

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TRUSTEES OF THE CITY HOSPITAL

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PREFACE.

Since the publication of the third series of City Hospital Reports, the surgical staff have been deprived by death of the valuable services of Doctors Wm. H. Thorndike and Chas. D. Homans. They need no notice from us, — their life-long devotion to their professional duties is too well known to be detailed.

The Editors.

May, 1889.

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SURGICAL CASES,

BY

DAVID W. CHEEVER.

CEREBRAL LOCALIZATION.
THREE HUNDRED AND THIRTY-THREE CASES OF HEAD INJURY.
EXOSTOSES OF HEAD AND FACE.
NASO-PHARYNGEAL POLYPUS.
EXCISION OF NERVES.
TUMORS OF TONGUE.
THYROTOMY.
FRACTURE OF THYROID CARTILAGE.
WOUND OF BACK OF TRACHEA.
THYROID TUMOR.

SURGICAL CASES.

By David W. Cheever, M.D.

CEREBRAL LOCALIZATION.

Patient was 32 years old. Family and previous history good.

Present Trouble. — About 4.30 this afternoon, Sept. 22d, patient was bicycling on Chestnut hill, when he took a header, striking on the left side of the head and shoulder. Became immediately unconscious. Brought to hospital at 10 P.M., still unconscious. Cannot be aroused to answer questions.

Physical Examination. — Large, well developed and nourished. Unconscious. Protruded tongue once beyond teeth on request. When irritated executes irregular spasmodic movements of limbs; more marked on right side. Left leg kept most of the time rigidly extended. All limbs seem to be in a spastic condition. Patellar reflex much increased on both sides. Pupils equal; of medium size; react sluggishly to light. Tongue protruded in median line. Pulse, 70; respiration, 30, at times stertorous and slightly blowing. Surface temperature high. Urine passed semi-unconsciously; patient seems to know what he is doing, but is unable to prevent it. Has an abrasion, with slight swelling, over left malar and zygomatic region; no fracture made out. Abrasion over left shoulder and left external condyle. Ecchymosis over styloid process of left ulna. No fracture or dislocation. Has compound dislocation of right little finger [reduced before entrance], with rupture of the transverse ligament between the fourth and fifth metacarpals.

Heaters to feet, ice cap to head.

Sept. 23. Still unconscious. Calomel, gr. 5, caused good catharsis, without change in patient's condition.

Sept. 24. Yesterday and last night required restraint with sheets, as the patient tossed about aimlessly, and nearly fell out of bed. He seems to comprehend faintly what is said to him, but cannot respond. To-day, put out tongue about one inch beyond teeth. Pupils equal; slightly dilated, and react sluggishly.

Sept. 25. Condition remains about the same. Swallows liquid nourishment fairly well.

Sept. 30. Patient no worse. At times appears more rational; then, again, seems very dull. Temperature has been up for two days. Thought to have some ptosis of left lid. Pupils react.

Oct. 3. Slight improvement over past few days. Temperature coming down. To-day examined by Dr. Prince. Nothing definite perceived; whistled when asked to do so. No deviation of tongue. Some differences in axis of pupils noted. Lively patellar reflex.

Oct. 4. Pupils sluggish, but react. Answers questions, and seems a little brighter. Swallows, and takes nourishment well. Cellulitis of forearm apparently doing well. Poulticed. Incision, one inch long, on dorsum of thumb, and one-half ounce of pus evacuated.

Oct. 5. Examined to-day by Mr. Victor Horsley, of London, England.

Mental State. — Very dull; obeyed orders when loudly roused.

Movement, Purposive. — Of upper limbs, equal. Of lower limbs, right moved more freely than left, and patient habitually kept the right foot crossed over the left leg. Ptosis of left upper lid. Tongue protrudes toward the left.

Non-purposive. — Marked rigidity in left lower limb. Moderate rigidity in right lower limb.

Pupils. — Left pupil slightly more sluggish than the right.

Sensation. — Patient sensitive to pain, but too stupid to elicit any information.

Reflexes, Superficial. — (1.) Plantar, present, both sides.

(2.) Cremasteric and abdominal, absent.

Deep. — (1.) Wrist-jerk; well marked on left side.

(2.) Knee-jerk; both sides increased, with spasm of

adductors coexcited by the blow. Jerk more marked on the right side.

(3.) Ankle clonus; present on both sides; more on right side.

Ophthalmic Examination. — Both fundi normal; discs rather pale.

Temperature. — Equal in the axillæ.

Head. — Abrasion, as described above. Pressure on the right squamous bone just below the parieto-squamous suture, and in a vertical line with the external auditory meatus, gave pain, as distinctly indicated by the patient's expression, etc. Nothing else noteworthy.

Diagnosis. — Laceration of superior and middle temporal gyræ on the right side in their posterior thirds. Some subdural extravasation extending over the posterior halves of these gyræ and the neighboring portions of the supra-marginal and annectant gyræ.

The seat of laceration having been sought for by drawing an oblique line across the head, from the malar bone, on which, evidently, the patient fell, the obliquity of the line being conceived to have been that of the direction of impact, the localized tenderness on pressure located the site of mischief.

The unilateral changes in movement, reflexes, etc., pointed to the right hemisphere being damaged and compressed slightly around the posterior thirds of the temporal gyræ.

The equality of the temperature on the two sides of the body negatived (as did also the character of the pareses), the supposition of a lesion in the so-called "motor" region.

Unfortunately the patient was too dull to admit of the hearing being investigated. The monocular character of the paresis of the lid, etc., is, in the light of Dr. Reeves and my recent work, only confirmatory of the above-expressed opinion. The same work also indicated to me the distribution of the paresis of the tongue, etc.

Prognosis. — General tendency to improvement, unless septicæmia should follow the condition of the arm, when the focus of laceration would probably soften, and might become an abscess.

Incision made in upper and posterior part of forearm. ℥ iv of pus evacuated. Poultice.

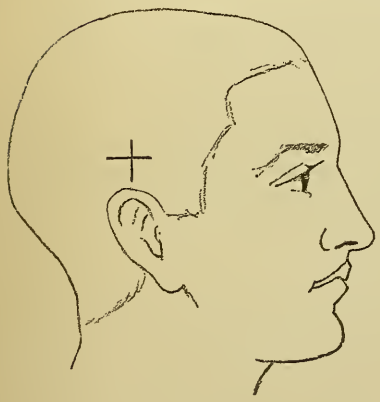
Oct. 6. Temperature was up last night, but down this morning. Apparently doing well. Patient has become considerably emaciated since entrance, especially in the face. On this day, and at a previous examination, by Dr. Morton Prince, crossed paralysis of the third and seventh nerves was noticed. This led Dr. Prince to infer a lesion at the base of the brain, pressing on the nerve, after its exit.

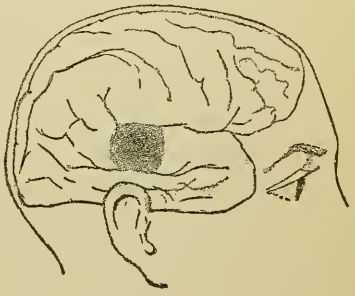
Oct. 7. Slight improvement seems to continue. Takes nourishment, milk and eggnog, well. Passes urine and fæces in bed, apparently not owing to paralysis of sphincters, but to mental dulness.

Oct. 8. More stupid this morning. Cannot be aroused to answer questions or protrude the tongue. Pupils react. Emaciation increasing. Swelling and redness of arm much diminished. Charcoal poultice continued. Paresis of right superior rectus noted by Dr. Prince. Temperature and

respiration up. Lungs examined; nothing abnormal found except some dryness of tubes, with a few sibilant rales.

Oct. 8. Pupils more sluggish this morning. Apparently more stupid, but is said to have recognized father and mother. Pulse 120. Ether. Operation by Dr. Cheever. Crucial incision over right ear down to the bone (vertical incision extending two and one-fourth inches up from pinna). Periosteum retracted. Three-fourths inch trephine over parieto-temporal suture. Dura mater bulges in the wound. No pulsation. When dura was incised a





clear serous fluid exuded in large quantity. When brain was cut into, fluid continued to flow; apparently from all sources. Probe passed directly down and in, more than three inches, without resistance. Little finger passed in its whole length. Soft disorganized cavity found. No pus; no clots turned out. Small drainage-tube, two and one-half inches long, inserted. Skin wound partially closed with silk suture. Patient had about six ounces of ether. Pulse remained good during operation; full, rather soft, about 86 per minute. Condition apparently good after the operation.

Oct. 10. This morning breathing more rapid; patient cannot be aroused. Pupils now dilated and sluggish. Puffing of both cheeks and lips with respiration. Later he

became markedly cyanosed, and died at 2.45 P.M. Discharged. Dead. Partial autopsy.

Oct. 10, about 5 P.M. Calvaria was removed, and brain examined *in situ*. (Friends objected to more complete examination.)

There was no sign of injury to base of skull to be found on raising anterior lobes, the anterior and middle fossæ being exposed; also the posterior fossæ examined. The opening of the wound was just below the fissure of Sylvius in posterior half of temporal lobe. Wound extended directly in, opening the lateral ventricle. A probe in wound passed directly below centre of corpus callosum. The wound was of a size to admit the little finger, and contained some fresh blood-clot. Around this wound was an area, about one fourth of an inch deep, of grayish, softened brain substance, evidently due to some process that existed previous to the operation.

Left lobe examined, and nothing abnormal found. Remainder of encephalon normal. Considerable amount of serous fluid at base of skull. Dura clear, and non-adherent throughout.

AN ANALYSIS OF THREE HUNDRED AND THIRTY-THREE CASES OF HEAD INJURY.

Admitted to the Boston City Hospital between January 1, 1877, and January 1, 1887.

Collated and Analyzed by Doctors R. W. Lovett and J. C. Munro, *former House Surgeons.*

The accompanying analysis of 333 cases of severe head injuries is based on the records of the cases received at the Boston City Hospital from January 1, 1877, to January 1, 1887; cases of slight injuries, such as scalp wounds and injuries of the face, are not included here.

For convenience, the injuries are divided for consideration into seven classes, as follows: —

	Cases.	Recoveries.	Deaths.	Autopsies.
Concussion	105	83	22	7
Fracture of base	78	15	63	24
Compound dep. fracture	58	28	30 (1 doubtful)	3
Simple dep. fracture	16	8	8	1
Compound fracture without dep.	40	23	17	3
Gunshot injuries	22	13	9	6
Unclassified	14	3	11	3
	333	173	160	47

CONCUSSION.

To consider, first, the cases of concussion, it is to be regretted that it was not possible to note the time between the occurrence of the accident and the time when the observations were made; but there were no data in the records on the subject. The cases, however, as a rule, were brought to the hospital directly after the accident, and the examination was, therefore, almost always made within one or two, or at most a few, hours after the injury.

Of the one hundred and five cases of concussion, eighty-

three recovered, twenty-two died, and seven autopsies were made on cases which presented nothing remarkable, as far as symptoms went, being routine cases.

All of the seven showed contusion of the brain-substance, with extravasation of blood.

1. Blood everywhere in arachnoid and many extravasations.

2. Contusion in right lower frontal lobe, and hemorrhage in corpus striatum.

3. Contusion in left lower frontal lobe, and some blood under the dura.

4. Small extravasations at the convexity.

5. Right subdural clot, compressing the brain.

6. Extravasations in several places, and a subdural hemorrhage.

7. A central hemorrhage in the left parietal convolution, and the left lateral ventricle full of blood.

The reaction of the pupils to light after the injury was a matter of much significance. In fifty-seven cases they reacted normally, and forty-seven of these recovered. In sixteen they did not react, and only nine of these recovered. In the remaining case they were not noted.

As recovery seemed to have followed in most cases where the pupils reacted, the ten fatal cases where the pupils reacted were investigated more fully. One had rupture of the spleen and liver, one had fractured spine, and two had very serious fractures of the ribs. In these four cases the death seems to have been due to these other injuries, leaving only six cases where it is to be noted that the pupils reacted.

In the nine cases where the pupils did not react, but which recovered, one was unconscious for two days, and had symptoms of brain compression; a second was unconscious for twenty-four hours, and had stertorous respiration and hemiplegia; a third had long unconsciousness and hemiplegia; and three more were unconscious for many hours, leaving three where the symptoms were only of moderate severity. In short, reaction of the pupils was a most favorable prognostic sign, failing chiefly where death took place from other injuries than the concussion.

As to unconsciousness, sixty-nine of these cases were unconscious for a shorter or longer period, and fifty of them recovered. Six cases are noted as not having been unconscious at all, and they all recovered; all were, however, delirious or mentally disturbed in some way. Of the twenty-two fatal cases, unconsciousness was present in nineteen, while the remaining three contained no mention of the fact, one way or the other.

Retention or incontinence of urine was noted in twenty-seven cases; eighteen recovered, nine died.

Paralysis in eight cases among those who recovered was noted, and twice in the fatal cases. Eleven of the twenty-two fatal cases were expressly noted as *having no* paralysis at any time.

The average duration of the fatal cases was four days; in only three cases did death occur in less than twenty-four hours, and two cases lived for ten days, and one for three weeks. The average stay in the hospital in recovery cases was two weeks.

Certain of these cases were probably fractures of the skull, although the symptoms did not warrant a positive diagnosis, and they had to be classed as "concussion."

FRACTURES OF THE BASE OF THE SKULL.

There were seventy-eight cases with fifteen recoveries and sixty-three deaths. Autopsies were made in twenty-four cases.

Autopsies in Cases of Fracture of the Base.

1. Fracture of petrous portion of temporal bone and occipital bone; intra- and extra-meningeal hemorrhage; laceration of the brain.

2. Fracture of both temporal bones, wing of sphenoid, frontal bone (vault), and right orbital plate; no cranial hemorrhage.

3. Fracture of both parietal bones, frontal bone, and base; clot outside dura, bone pressing on dura; hemorrhage into ventricles; clot at base.

4. Fracture of vault and two fractures of base; brain injected, especially at tubercula quadrigemina.

5. Comminuted fracture of base; fracture of left side of occipital bone; clots between dura and pia.

6. Fracture of left temporal bone, extending across the base; clot under fracture and one on opposite side; effusion of blood in brain.

7. Depressed fracture of base; contusion of brain.

8. Fracture of base; cerebral congestion.

9. Complete transverse fracture of base.

10. Fracture of base; hemorrhage under dura and into brain.

11. Large abscess of one side of brain; fracture of orbital plate.

12. Outer table intact; fracture of inner table and of base; rupture of opposite meningeal artery; post-ocular effusion of blood.

13. General pneumonia in right, and lobular pneumonia in left lung; fracture of left ilium; brain normal; meningeal vessels injected; outer table normal; inner table fractured from foramen magnum to sagittal suture.

14. Four fractures at base; one depressed fragment; acute purulent lepto-meningitis; yellow softening at base; subdural hemorrhage.

15. Fracture across base, with hemorrhage.

16. Fracture from parietal eminence through temporal and frontal bones to inferior wing of sphenoid through sella turcica; left temporal lobe disorganized; clot of size of 25-cent piece in vertex.

17. Fracture of left anterior fossa over left optic foramen; crack into right optic foramen and in right temporal bone; meningitis of base.

18. Fracture of occiput extending to base; laceration of base of brain; contusion of liver and kidney.

19. Fracture of base from left to right petrous portion of temporal bone through sella turcica; over right orbital plate a clot; fracture of liver, radius, and vertebra.

20. Fracture of base; hemorrhage into brain; laceration of brain; clot in cerebellum; fracture of left side of occipital bone; hemorrhage into lower half of temporal lobe.

21. Fracture of petrous portion of temporal bone, sphenoid and orbital plate; meningitis of base; inhalation pneumonia.

22. Fracture of occipital bone into foramen magnum; hemorrhage into left frontal lobe and between the dura and pia; chronic interstitial nephritis.

23. Fracture of base; inter-meningeal hemorrhage; traumatic softening.

24. Linear fracture from vertex through temporal bone to base; large clot on right side over dura.

Case 11 entered the hospital as a case of concussion, and was discharged relieved in four weeks. He reëntered a week or so afterwards, on the medical side, and died.

Case 14, a girl 6 years old, was discharged at request of parents on twelfth day after injury, her mind being rational; she remained in this condition until the twentieth day, when she died in convulsions.

Case 15, a man 60 years old, applied as an out-patient, and was thought at the time to be drunk; he refused to enter the hospital, went out after the wound in his scalp was dressed, and was brought back the next morning, having been found unconscious on the street. No sign of fracture could be seen in the wound, even after death, the fissure starting at some distance from the external injury.

Case 17 was assaulted three days before entrance, and lived only twenty-four hours after.

Of the sixty-three fatal cases of base fracture the pupils reacted to light in seventeen, in thirty-nine they did not respond, and seven were not noted; of the recoveries, eleven cases reacted to light, one did not react, and three were not noted. In one case, where there was fracture of the sphenoid bone and disintegration of the temporal lobe with a large blood-clot, the pupils reacted normally to light during life. In general, however, the inability of the pupil to react to light in cases of suspected base fracture should be regarded as a very unfavorable sign.

The injuries causing fractures of the base of the skull were very serious, more so than those associated with the other head injuries. They were mostly falls from great heights,

railway accidents, and the severest kind of concussion, as in runaway accidents and blows by heavy falling bodies.

In sixty-five cases unconsciousness was present as a symptom; of these, fifty-five cases were fatal and ten recovered. In only six cases was unconsciousness noted as being absent, and of this latter group one was fatal and five recovered.

The location of external wounds in relation to the paralysis which followed is shown below. There were seventeen cases of paralysis noted.

1. Right hemiplegia following contusion of left side of head.
2. Right hemiplegia following contusion of left frontal region.
3. Right hemiplegia following contusion of occipital region.
4. Right hemiplegia following no especial external injury.
5. Left hemiplegia and right facial after right frontal contusion.
6. Left hemiplegia and right facial with no external injury.
7. Left hemiplegia and left parietal contusion.
8. Left hemiplegia at the same time with hemorrhage from left ear.
9. Left hemiplegia and left fronto-parietal contusion.
10. Paralysis, and no mention of location of injury.
11. Paralysis of right arm and ecchymosis of right eye.
12. Paralysis of left arm after left parietal contusion.
13. Right facial paralysis and blood from right ear.
14. Left facial paralysis (six days after injury) and blood from left ear.
15. Left facial paralysis (ten days after injury) and blood from left ear.
16. General paralysis; no external injury noted.
17. Paralysis slight; no mention of location of injury.

Twelve died and five recovered.

Bleeding from the ears alone occurred in five recovery and twenty-three fatal cases, while from the nose, or the nose and ears, it occurred in six recovery and twenty-five fatal

cases. No bleeding from either locality is recorded in only one recovery and three fatal cases.

Sub-conjunctival hemorrhage was recorded in five recovery and thirteen fatal cases; was absent in one recovery and two fatal cases, and was not noted in the remainder.

The length of life in fatal cases falls into two classes, —that in which the patients lived two days, or more and that in which they lived less than two days. In the former, comprising twenty-one cases, one lived four weeks, and several lived ten days or more. In the latter class, comprising thirty-nine cases, the average duration was ten hours. Two cases died immediately on receipt of injury.

Purulent meningitis was present in three who died in three, four, and twenty days; abscess of the brain in the one that lived four weeks.

Two had extensive clots found at autopsy, but without meningitis, though death had taken place more than forty-eight-hours after injury.

One case, with meningitis, also had inhalation pneumonia. In no case dying within forty-eight hours was meningitis found, and no collateral injury which was likely to have caused death except in three cases, where pneumonia, fractured liver, and contused liver were present each in one case.

The records leave it uncertain from the insufficient data given whether the fifteen recorded recoveries from fracture of the base were in reality fractures of this sort, although they were so considered at the hospital. From the twenty-four autopsies it would appear that the injury was rapidly fatal in almost all the cases. In the case in which death did not take place for three weeks, it followed meningitis, and the injury was known to be quite extensive. It is therefore not improbable that recovery may take place in less severe fractures of the base where sepsis does not supervene, and that of the fifteen so-called recoveries, some may have been veritable fractures of this kind.

Synopsis of Cases where Recovery is

	No. 15.	No. 20.	No. 26.	No. 29.	No. 50.	No. 56.	No. 85.
Age. — Sex.	M. 24.	M. 57.	M. ?	M. 29.	M. 30.	M. 44.	M.?
Unconscious	For 7 days.	Yes.	Wandering; conscious.	No.	Semi.	Semi for 1 day.	
Pupils react.	At first, not later, strabismus.	Right increased and not reacting.	Normal.	Yes.	Normal.	Yes.	
Pulse	40 — 80.		Normal.		Normal.	Strong.	
Respiration				Normal.			
Hemorrhage from ears	Right.		Both.	Left.	Left.	Left.	
From nose	Yes.				Yes.		
From mouth							
Subconjunctival Ecchymosis	No.	Yes.					Yes, for one week.
Ecchymosis elsewhere							
Retention	Yes.	Yes.	Yes.				
Paralysis	Right side of face.	Right arm.	None of legs.	No.	Left side of face.	Left side of face on 6th day.	
Vomiting	Blood.		Yes.	No.		Yes.	
Deafness	At discharge.						
Injury	Fall.	Fell down hold of vessel.	Fell down stairs.	Struck by a plank.	Fell 20 feet.	Fell from horse-car.	Fell 30 feet.
Duration of illness	23 days.	1 month.	2 weeks.	16 days.	1 month.	6 days.	1 month.
Remarks	Aphasia on 13th day.	Delirious for a few days, could talk somewhat at discharge.	No headache nor dizziness on discharge.	No head symptoms.	Facial paralysis at discharge.	Headache on 3d day.	Fracture femur, patella, and sprain of elbow. No symptoms given, but called fracture of base at time of injury.

recorded after Fracture of the Base.

No. 100.	No. 124.	No. 143.	No. 160.	No. 175.	No. 183.	No. 249.	No. 102.
M. 37.	M. 17.	F. 4½.	M. 53.	M. 11.	M. 7.	M. 31.	M. 75.
No.	Semi.	Dazed.	For 2 days.	At first.	Semi.	Yes. Delirious later.	Confused.
	Yes, dilated.	Slowly.	Yes.	Normal.	Yes.	Normal.	
	90— dull.	120.		60.	Rapid.	Strong, full.	Normal.
Right.	Left.		Left.	Left.	No.	Right. Left 2 days later.	
Yes.	Yes.		Yes.		No.		Nose.
Yes.			Yes.		No.		
		Right.			Both eyes.	Left.	
		Both lids.					Lids.
No.				No.		Slight.	No.
	Yes.			Yes.	Yes.		Yes.
On 6th day.							
Fell 55 feet.	Fell 3 steps down to a marble floor.	Fell 3 stories.	No history. Drunk.	Struck by a train.	Both wheels of a cart ran over head.	Fall.	Fell one flight.
10 days.	10 days.	2 months.	8 days.	8 weeks.	3 weeks.	2 weeks.	5 weeks.
		Fracture of jaw and femur. No head symptoms.	Headache.		Fracture of jaw.		

SIMPLE DEPRESSED FRACTURES.

There were sixteen cases, and eight recovered while eight died, and there was one autopsy which showed a fracture of the right parietal bone; one other case of parietal depressed fracture was trephined while alive, and the inner table was found intact. The class of injuries which produced this comparatively uncommon form of fracture of the skull were very severe ones. Like fractures of the base, they were caused by falls from considerable heights and railroad accidents. Head symptoms were present in all cases except one, which recovered. All fatal cases died within twelve hours, with the exception of one that lived 24 hours. Of course the injury was less fatal in children. Of the sixteen cases seven were children, and five of these recovered. In fact, it was the only class of head injuries in which children appeared to any extent as patients. The location of the injury was as follows: —

	Fatal.	Recovery.	Total.
Frontal	2	2	4
Fronto-parietal	1	0	1
Parietal	4	5	9
Vault	0	1	1
Not noted	1	0	1

COMPOUND DEPRESSED FRACTURES.

There were fifty-eight cases in all, and twenty-eight recovered while twenty-nine died, and one patient, with fracture of the femur also, was taken home by the parents, and probably died there.

There were three autopsies, — 1 (after trephining), there was a sloughy hole reaching the lateral ventricle, but no meningitis; 2 (after trephining), a purulent meningitis; 3, meningitis.

Of the fifty-eight cases, forty had head symptoms, and sixteen had none, and every one of the latter class recovered. Trephining was done for head symptoms eighteen times, and five recovered. Three times it was done for the depression alone, and all three recovered.

The location of the injury was as follows: —

	Fatal Cases.	Recoveries.	Total.
Frontal	10	14	24
Fronto-parietal	4	3	7
Parietal	8	9	17
Occipital	2	0	2
Temporal	4	1	5
Vertex	1	0	1
Whole head	2	0	2

The size and depth of the depression varied very much in extent and shape, — one case, with a depression of three-fourths of an inch deep, recovered without operation.

Nine cases were followed by paralysis, and in every case the hemiplegia was of the side of the body opposite to the injury of the skull, — an interesting contrast to the relation of the two in fractures of the base.

The duration of life in fatal cases falls into two interesting groups: those cases which lived only a few hours (the average being ten hours for twelve case), and those which lived for several days (the average being fifteen days for eighteen cases).

On a closer study of the rapidly fatal cases we find that two had a general crushing of the head, three were five years of age or under, one was otherwise injured in a railroad accident, and in five a diagnosis of a concurrent fracture of the base is extremely probable, but could not be accurately verified.

In over one-half of the fatal cases that lived two or more days, there is distinct evidence of sepsis. One other case had fracture of the spine besides the head injury.

COMPOUND FRACTURES WITHOUT DEPRESSION.

There were forty cases with twenty-three recoveries, and seventeen deaths; of three autopsies, one showed death to have been due to meningitis and inhalation pneumonia, while the other two were cases of meningeal hemorrhage, and laceration and extravasation in the brain-substance.

	Fatal.	Recovered.
The pupils reacted in eighteen cases . .	6	12
The pupils did not react in six cases . .	5	1
The pupils were not noted in sixteen cases .	12	4

In general, twenty-three cases had head symptoms, and eleven recovered while twelve died; thirteen had no head symptoms, and of these, ten recovered. The location of the injury was as follows: —

	Fatal.	Recovery.	Total.
Frontal	7	8	15
Fronto-parietal . . .	1	0	1
Parietal	4	14	18
Temporal	1	1	2
Occipital	3	0	3
Indefinite	1	0	1

Two cases were trephined, one at entrance, for serious head symptoms, and a clot removed, and one, twelve days after the injury, where meningitis came on; both died, unrelieved by operation.

Of the seventeen fatal cases, eleven died within twenty-four hours, and the rest lived from two to fifteen days, the average being a little over six days.

GUNSHOT INJURIES OF THE SKULL.

There were twenty-two of these cases; thirteen recovered and nine died. Of the recovery cases, nine had no head symptoms, although in two of these (one being a case of trephining) the ball passed through the skull into the brain. In nearly all of the remainder the ball lodged in some harmless locality, as the mastoid process or the frontal sinus. Of the four cases of recovery that had head symptoms, one (a case of trephining) was shot through the hard palate, and had marked evidences of cerebral injury; another had right facial paralysis and divergent strabismus of the right eye, after a bullet-wound of the right frontal bone; a third, unconscious for a while, was discharged with ptosis of the right lid, after a bullet-wound of the right frontal bone, and the

fourth, wounded in the right eye, was unconscious for three days, and discharged from the hospital without the ball having been removed.

Of the fatal cases, two were trephined, and with a third will be considered more at length under that head. Of the remaining six cases —

(1.) Bullet-wound of the vertex; unconscious throughout; temperature over 104° F.; death in thirty-six hours. Autopsy showed a perforation in posterior superior angle of the right parietal bone; extravasation over the right hemisphere, in the occipital region, and extending nearly to the foramen magnum.

(2.) Bullet-wound; lived only a few hours, the autopsy showing the path of the ball through the right orbital plate and brain to the occiput.

(3.) Bullet-wound of the right ear; facial paralysis; death in nine days. The autopsy showed the ball one-half inch in the brain; pia injected; much pus from the wound; internal pachymeningitis of the right temporal region.

(4.) Bullet-wound of right frontal region; delirium and incontinence of urine; death in three days. The autopsy showed a general meningitis, the ball having passed through both hemispheres.

(5.) Bullet-wound; death in a few hours. The autopsy showed the right side of the brain and membranes filled with a clot; a small hole through the inner side of the orbit; the ball lodged in the right middle lobe.

(6.) Bullet-wound of the right temporal region; death, after marked cerebral symptoms, in one or two hours.

UNCLASSIFIED INJURIES.

Fourteen cases had to be entered under this head; three recovered while fourteen died. There were four autopsies.

One showed simple fracture of frontal and parietal bones; no diagnosis being made ante-mortem.

A second showed simple fracture of vertex, extending through temporal bone to base.

A third showed fracture of right temporal and parietal bone, with rupture of meningeal artery and large clots.

A fourth showed fracture of left frontal, parietal, and occipital bones; meningeal hemorrhage. Fracture of ribs.

One recovery was in the case of an insane man. Of the fatal cases, five died within twenty-four hours.

TREPHINING.

The operation of trephining (excluding cases in which only loose fragments of bone were removed) was done twenty-nine times; ten recovered and nineteen died. The operation was done for —

	Recovery.	Death.
Compound depressed fracture . . .	7	13
Simple depressed fracture . . .	0	1
Compound fracture without depression .	0	2
Gunshot injuries	3	2
Fracture of base	0	1
	10	19

In the cases that recovered, the operation was done immediately or soon after admission to the hospital in five cases that had no head symptoms, and three with head symptoms; it was done late once in each of these classes.

In the fatal cases the operation was done immediately or soon after admission to the hospital in thirteen cases, and late in six cases.

In four cases, however, there was a fracture of the base also, or a strong evidence of such a fracture.

In seven cases death took place within forty-eight hours, two being cases with severe head symptoms, and two being basal fractures.

In twelve cases, where death took place from forty-eight hours to several weeks after injury, there were two with evident fracture of the base, seven with undoubted sepsis of the brain or its membranes, and in three the exact cause of death is doubtful.

Thus, the operation was fatal in 65.5 per cent. of all the

cases trephined. Comparing these results with those in the "Surgical History of the Rebellion," we find that of one hundred and ninety-six cases of trephining, in the latter 56 per cent. were fatal, the primary operations being more fatal (69.6 per cent.) than either the intermediary (56.6 per cent.) or the secondary (23.5 per cent.), while in our cases only 61.9 per cent. of primary operations were fatal.

TREPHINING IN GUNSHOT INJURIES OF THE SKULL.

The operation was done in five cases with three recoveries.

In one of the latter it was performed on the fourteenth day for symptoms of compression, the patient being subsequently discharged to a public institution, with partial recovery from a hemiplegia.

In the second case, a boy 11 years old, the vault was trephined and a ball removed; there were no head symptoms.

In the third case the ball was first removed, and then the skull trephined to remove a depression of the bone; the operation was followed by delirium at times, but the patient subsequently recovered.

Of the fatal cases, one died in two days and the other in a few hours; in neither case was the bullet found, and in both the head symptoms were severe, the wound being in the temporal region.

Besides these cases of trephining, there was one fatal case of injury to the frontal bone, in which the fragments were removed, exposing the brain. There were marked head symptoms, besides incontinence of urine and right hemiplegia, death occurring on the tenth day. The autopsy showed hemorrhage into the pericranial connective tissue; fracture of the walls of the left frontal sinus, fracture of the crista galli, both orbital plates, and the body of the sphenoid bone; traumatic red softening; acute bronchial pneumonia and pulmonary hemorrhage.

TREPHINING IN FRACTURES OF THE SKULL OTHER THAN GUNSHOT INJURIES.

Simple Depressed Fracture. — The operation was done in one case with a fatal result, the inner table of the right

parietal bone on trephining being found intact. Death, preceded by convulsions, took place within twelve hours, and from symptoms during life, such as epistaxis, unconsciousness, delirium, etc., the supposition is that there was some graver associated injury.

Compound Fracture without Depression. — There were two cases of trephining with fatal results. One a woman, 50 years old, was trephined immediately after injury to the right parietal bone, and clots were removed, but with no improvement in her condition, death taking place in fifteen hours. The other, a man, 28 years old, delirious on the second day after injury, was trephined on the twelfth day, and a meningitis was found, but no depressed bone. Death took place three days after operation.

Compound Depressed Fracture. — Seven cases operated on recovered. Four had no head symptoms, three being trephined within forty-eight hours after injury, while the fourth was not trephined until six weeks after injury, and then because of necrosis. In the three that had head symptoms the operation was done immediately after injury, and in one instance there was immediate relief from delirium, but not from a strabismus caused by the accident. All the cases were adults except one child, 10 years old, that had unconsciousness and retention before operation.

In thirteen cases the operation was followed by death; all but one, a child 5 years old, were adults from 24 to 60 years old. Nine were trephined immediately or within forty-eight hours after injury; and of this group —

(1.) Death in thirty-six hours with no relief to head symptoms.

(2.) Unconsciousness or delirium most of the time; sensory paralysis of left side, and at times facial paralysis. After death, on the twelfth day, examination showed a hole in the region of the right parietal eminence reaching the lateral ventricle, and with sloughing edges; no meningitis and no other head injury.

(3.) Boy, 5 years old; hemorrhage and collapse after operation; death in five hours. By the trephine and removal

of loose pieces, a hole the size of a silver dollar was made in the vertex over the coronal suture.

(4.) Trephined in the right frontal bone on the second day after a kick from a horse; retention; aphasia on the ninth day; spasm of the left side of the face and of the right side of the body; death on the fourteenth day.

(5.) Injury to the right parietal bone; hemorrhage from the longitudinal sinus that was torn by a loose piece of bone; left hemiplegia two days later; death on the fifth day, with symptoms of meningitis.

(6.) Trephined the day after injury in the right frontal bone and the inner table found fractured; return of consciousness, which continued to the eighth day, when the temperature rose to 104° F., and death followed after a brief period of unconsciousness. During life there were also symtoms that pointed to a concurrent fracture of the base. No autopsy was obtained.

(7.) The dura found uninjured after operation; paralysis of the soft palate followed later, and retention preceded by incontinence. Death on the fourth day.

(8.) Ocular and lingual paralysis; frontal bone trephined and clots removed, the dura being found to be roughened; pus from the wound later; death in five and a half weeks.

(9.) After trephining and removing fragments, a fissure was discovered extending towards the base; death in a few hours, without relief, from head symptoms.

Of the four that were trephined late —

(1.) Left hemiplegia and strabismus until operation in the right posterior parietal region twelve days after injury; escape of pus and brain tissue at operation; death three weeks after injury.

(2.) Injured by a falling brick; four weeks later patient was discharged relieved; eighteen days after this he reëntered and was trephined, carious bone being removed from the left frontal bone, and a hole extending two inches into the brain being found. With the exception of a divergent strabismus of the left eye there were no marked symptoms until just prior to trephining, when the patient was unconscious at

times, had right, and later, left hemiplegia, and anæsthesia of the right side. Death four days after operation.

(3.) Injured in the left-frontal region by a falling brick six days before entrance; patient walked to the hospital and was trephined immediately, the dura being opened. After operation the temperature rose to 107° F.; delirium; left hemiplegia, and convulsions appeared, followed by death one day after operation. Autopsy showed a purulent meningitis of the base and vault, but no other lesions.

(4.) Injured two weeks before entrance into the hospital in the left temporo-parietal region; was trephined, but no pus found; there were no head symptoms until operation, when aphasia and right hemiplegia appeared, and continued until death four days afterwards.

Fracture of the Base. — One case was trephined on the fifth day after a fall, because of a suspected fracture of the right parietal bone, but no fracture or other lesion was found in that region. Death occurred fifteen days after the accident.

REMOVAL OF LOOSE FRAGMENTS OF BONE.

There were a certain number of cases in which loose fragments were removed without any further operative interference beyond enlarging the scalp-wound where necessary.

Simple Depressed Fracture. — One case in which the dura was wounded, with a hernia of the brain and hemorrhage, died in twenty-four hours without regaining consciousness.

Compound Depressed Fracture. — One case recovered, six pieces of a stellate fracture of the right parietal bone being removed.

Eight cases were fatal —

(1.) Besides a fracture of the left temporo-parietal region, there were symptons of a basal fracture also. Death twenty-four hours after injury.

(2.) Boy, 5 years old, with grave symptoms, lived less than twenty-four hours.

(3.) A general crush of the skull; lived only a few hours after injury.

(4.) Kicked by a horse in the left fronto-temporal region; removal of eight fragments; right hemiplegia coming on

gradually, and ptosis in the course of a week; cerebral hernia soon followed, and death eight weeks after injury.

(5.) Dura of right frontal region found wounded; six days later hernia, and on the ninth day, death. Before death the patient was excited and noisy.

(6.) Boy, 10 years old, with a compound comminuted fracture of the right side of the skull; lived only a few hours, having had severe head symptoms and spasms after the injury.

(7.) Removal of sixteen pieces from the frontal bone; death in seven days.

(8.) Railroad injury; marked head symptoms; death in nine hours.

As regards the value of the one symptom of the reaction of the pupils to light, without regard to the injury, an analysis in one hundred and sixty-five cases shows the great prognostic value of the symptom.

Pupils reacted.			Did not react.	
Total.	Recoveries.		Total.	Recoveries.
57	47	Concussion,	16	9
28	11	Base fract.	40	1
18	12	Com. frac. without dep.	6	1
103	70		62	11

That is, in any injury where the pupils reacted to light, 68% recovered; where they did not react, 17% recovered. No other symptom was of such great significance.

EXOSTOSES OF HEAD AND FACE.

M. L., 26, single, Ipswich, October 19, 1883. Seven years ago she first noticed a little fulness in the left temporal region. She did not know when it began, but since noticing it she has seen it slowly increasing. It has given her no pain till within a year or so, when she has had at times some neuralgia extending into the parietal region and down into the left

ear. The eye began to have some prominence about two years ago. She has cloudy vision, and occasionally some pain in the left eye. Hearing not affected. Within a year has had sick headaches with vomiting as often as once or twice a month. Dizzy spells were a symptom last winter; but she has had none now for three months.

Examination. — There is a marked fulness in the left temporal region, which seems to be a mass about as large as a half horse-chestnut: small and rounded, immovable; very hard; skin movable over it, not tender or red; no swelling. Seems to be located in the temporal fossa, just behind the zygoma, and affecting the greater wing of the sphenoid. There is a marked prominence of the left eye. Was seen by Dr. Wadsworth in August, and the ophthalmic appearances then were those of optic neuritis.

Left eye prominent. Pupils in a slightly darkened room were a little irregular, the left being the larger, but in strong light they were equal, and both responded to light. Motion good in all directions. No double vision. Well marked "choked disk" in both eyes, showing an optic neuritis, probably from some implication of the brain. Last August this condition was confined to the left eye.

Vision tested: O. D., 20–20; not affected by glasses.

O. S., 20–70. With plus 150, is 20–30 plus.

Etherized and placed in operating-chair. Left temporal region shaved. Large semicircular flap, incision beginning at outer canthus, extending upward and backward in an arch, terminating at zygoma, just in front of tragus. Vessels of skin tied. Temporal muscle divided. Whole flap drawn downward. Parts about tumor scraped off, and mass found to be in the upper part of the temporal region, not attached to the zygoma or external angular process, but above both. Periosteum scraped off. Bled freely. Large trephine used to the depth of three-eighths of an inch. No penetration. Edges were chiselled, and whole block removed without at any point going through the bony mass. It was extremely vascular, and bled in jets, requiring plugging the bone vessels with pegs of wood. To control hemorrhage the wound was packed with sponges soaked with ferric alum, and cov-

ered over with a layer of absorbent cotton and compress, with a tight bandage about head.

[Dr. Gannett reported: "October 26, 1883. The specimen received day before yesterday from case operated upon by Dr. Cheever shows the following appearances: The portion removed from skull shows simply a tolerably compact bone-substance, containing numerous vessels. I see no reason for calling it anything else than an OSTEOMA."]

Slept quite well under Bromide, gr. xx. Bandage tight. Stained, but no hemorrhage.

October 26th. Outer dressing removed, but wound not disturbed.

October 27th. Much pain in head. Some foul odor. Carbolic cloths laid over head.

October 28th. Dressing all removed. No hemorrhage. Gentle irrigation. Granulations springing up. Dressed with carbolic oil on charpie every day. Reflected flap is healthy.

November 8th. Granulations very bright. Doing well.

November 12th. Flap strapped to bring it over the cavity.

November 25th. Edges of flap curl in and form a large nodule on the side of the head. General condition improving. Sight no worse since the operation.

December 1st. Etherized. Hair about the wound shaved. Incision in the curled-in flap. It was dissected off the mass of temporal muscle, which mass was cut out. Edges all about wound refreshed. Flap spread out to cover the granulating surface. Was held in place by nine silver sutures. Drainage allowed for at the external angle of the flap.

December 3d. Some erythematous redness about the edge from the congestion of the cellular tissue of the lids. No erysipelas.

December 6th. No swelling or blush on lids. Flap has retracted a little.

December 12th. All but one stitch removed.

December 15th. Last stitch removed. A large scar remains in the right temporal region, but will be entirely covered by hair when it is grown out.

December 18th. A small cervical gland on the left side

is enlarged. Goes out to be under the care of a physician in Ipswich. ℞ Syr. Ferri Iodidi dr. 1, t. i. d. Discharged; relieved.

After one year of comfortable health, the bone began to thicken again; partial blindness and epilepsy supervened. All further operation refused. Patient alive but no better in 1888.

Exostoses of Facial Bones. — F. W., aged 20, single, Westboro', 1886. Growth has been on face since he can remember. Parents died when he was young, and he has never learned whether he was born with it or not. Five years ago he was at the Massachusetts General Hospital, where Dr. Bigelow drilled out a piece, and found that the growth was bony throughout. It has about doubled in size during the past ten years. All his relations have very prominent eyes, but none, that he knows of, have had tumors of any sort. General health has always been good. Had typhoid fever three years ago, but nothing since.

Examination. — On either side of nose, just below the eyes, are two tumors, round, hard, immovable, not painful; right, size of small egg; left, size of English walnut. Left zygoma shows a similar nodule, projecting from the under side; and right lower maxilla has also a nodule. Both the latter are about the size of an English walnut. Can barely breathe through nose; a very small current of air. Eyes protrude one-third of their diameter in front of the frontal sinuses. Palate-arch very high and narrow, barely admitting the finger at the upper part. General development and nutrition very good.

February 13th. Operation, ether. Dr. Cheever made incision over the tumors with V-shaped flaps; chiselled about the base of each growth under orbits, the growth finally separating *en masse*, the left coming away with more difficulty than the right. The infra-orbital nerve was exposed under the right growth, lying at the bottom of a sort of socket in which the tumor rested. With the left growth part of the end of the nasal bone of the same side, together with a small piece of the mucous membrane lining the nose, came away. Very little bleeding from the bone. Periosteum very thick over the growth. Skin very vascular over

them. Wounds closed by suture, a drainage-tube being placed in each. Dressing of carbolic oil on compress laid over the wound. Good recovery from ether.

Tumors. — Very porous, hard bone, weighing, together, 708 grains. The right measured $2\frac{1}{4} \times 1\frac{1}{2} \times 1\frac{3}{8}$ inches; weight, 490 grains. The left measured $1\frac{1}{2} \times 1\frac{3}{8} \times \frac{7}{8}$ inches; weight, 218 grains. There were several small pieces chipped off, not included in the above.

February 14th. Much swelling of eyelids, cheeks, and forehead above nose. Had Sol. Morphia, dr. 1, for pain. Is fairly comfortable now.

February 15th. Swelling going down about forehead and eyes. Still swollen and red over wound. Dr. Cheever separated edge of the wound to-day, giving exit on each side to a small quantity of pus which had been pent up. Syringed daily.

February 17th. Stitches all out to-day. Pus comes from wound daily in small quantities. Swelling much less.

February 19th. Doing well; gauze and vaseline only over wound.

February 21st. Slight slough at apex of left flap.

February 24th. Swelling nearly gone. Wound healed on left side, except where apex of left flap sloughed. Area size of three cm. on right side; still secretes considerable pus, which comes through the outer angle of the flap.

February 26th. Pus thin and serous. Swelling not wholly gone.

February 28th. Still considerable pus from right side.

March 4th. Flaps opened on left side by Dr. Cheever, with escape of considerable serous pus. Left cheeks about the wounds more red and swollen. Left sinus syringes into nose. Right side has pocket at bottom of sinus, from which considerable pus comes on pressure.

March 8th. Rather smaller amount of pus from sinuses. Syringed out daily, and gauze, soaked in oil, applied.

March 13th. Face much less swollen than it has been; considerably less pus.

March 18th. Much less pus from sinuses; swelling very slight.

March 26th. Goes home; sinuses still open; discharge a small amount daily. Discharged, relieved.

In 1887 an abscess on right side of wound came on, with a limited necrosis, which was well after two months.

In January, 1889, a new exostosis was removed from the lower jaw. Original operation well.

NASO-PHARYNGEAL POLYPUS.

J. McG., aged 16, Bristol, R.I., February 21st. In 1875 polypus commenced to grow in the nose. After it had reached the size of an English walnut it was removed, in 1878. Afterwards it commenced to grow again, and is now large, and extends into pharynx.

February 22d. Patient etherized. Dr. Cheever operated. A cord was first passed through the tongue, and one through the polypus from the pharynx. An incision was then made along the left side of the nose, following around the ala, and down through the median line of the lip. The skin and tissues, down to the bone, were dissected back until the pterygoid process was exposed. The saw was then used, a horizontal cut being made from the pterygoid process through to the opening of the nares. The alveolar process was cut through. This separated the two superior maxillary bones, and the left superior maxillary was dropped, leaving an opening free to the upper attachment of the polypus. The polypus was then scraped off from the basilar process and posterior nares. The attachment extended down into the pharynx, and had to be separated by scissors. Attachments very firm. The polypus was about the size of an egg when removed, and filled fully the nares. The superior maxillary bone was then wired back in place; the flap brought forward and fastened by silk sutures. Water dressings applied. There was good reaction. Patient came out of the ether well, and felt no discomfort in the evening.

February 23d. Patient says he feels "first class," and is

anxious to get out of bed. Temperature normal. No pain. Apparently no swelling. Wound looks well.

February 26th. Stitches removed. Edges of wound well united. Eats well. Feels well. Jaw quite firmly attached.

February 28th. Improving. Wound healed by first intention.

March 1st. Very comfortable. Up for first time to-day.

March 13th. Patient etherized. Dr. Cheever removed the wire. The ring (?) broke off, and it remained in the bone.

March 17th. Doing very well. No disturbance from the ether.

March 18th. Examination shows the jaw firm. No return of the growth. Discharged, relieved.

Remained well in 1888. See previous cases reported.

EXCISION OF NERVES.

Facial neuralgia of the inferior dental nerve. Three operations, to excise and finally to remove the nerve, with the gustatory and the chorda tympani, at the foramen ovale. Recovery.

Patient, aged 34 years, single, South Boston, Oct. 30th, 1882. Eight or nine years ago, without known cause, patient began to have neuralgic pain [like the pricking of pins] over the right lower jaw at about its middle. Pain much severer at the times of the paroxysms of pain, but always a dull pain present. She had all the teeth of the lower jaw pulled, and the back ones of the upper jaw on the right side, but without relief. Since the first there has been tenderness over the seat of the pain. Since last April all the symptoms have been much worse. There has been pain day and night, but at the time of the paroxysms the pain is terrible, and accompanied by spasms of the facial muscles. These paroxysms occurred as often as a dozen a day, but now are more frequent. Says she can tell when

one is coming, by the pain jumping around in the side of the face. Pain begins in front of the ear or about the lower jaw, always on the right side, and spreads up onto the cheek, eye, and forehead. Lower part of the left side of the face very tender, and cannot be touched without exciting a paroxysm. In fact, patient says she cannot eat for fear of one. Face much congested during and after a paroxysm. General health of patient very good. She has seen many doctors, and tried all sorts of medicine without the least benefit. For the last two months she has taken no medicine whatever; is not an opium-eater. Comes in for operation. When the paroxysm comes, like a flash the head is drawn to the affected side, and the muscles of the right side of the face twitch violently. This causes the patient to make violent grimaces, and to smack her lips, as it were. T. 98, p. 60.

November 2d. Paroxysms severe and very frequent. Suffers much.

November 3d. Ether. Dr. Cheever made a crucial incision over the right lower jaw with its centre just above the angle. Periosteum stripped off and a trephine inserted. A shell of bone about one-sixteenth of an inch thick taken off, and the nerve exposed, running across the hole in the bone. Nerve cut the full width of the hole [about one-half inch] and removed. Hemorrhage from the bone controlled by pressure. Wound not closed, but packed with carbolic-oil dressing and pressure.

November 4th. Slept fairly well. Some pain in face, cheek, and in front of face on the affected side, and also some spasms. Wound doing well. Hardly any hemorrhage.

November 7th. Says she has no spasms in the lower jaw, although the side of the face is as bad as ever. Wound doing well. Tissues about considerably swollen, and feel sore.

November 9th. Paroxysms as severe and frequent as before the operation.

November 13th. Pain and paroxysms have been much milder since the ninth. Face not so drawn up. Goes about the ward, and does some work.

November 18th. Has had no paroxysms since the ninth, but

says there is more or less pain in the face, and face itself seems tender. Bone at seat of trephining granulating, but still uncovered about the hole. Wound granulating. Cannot yet move her lower jaw very well, and there is paralysis of the nerve supplying lower part of the face, so that the lower lip is drawn to the unaffected side.

November 26th. Bone almost entirely covered with granulations, and wound closed in to a large degree. Eats and sleeps tolerably well; takes no opium. Cannot open mouth yet, and paralysis of right side still remains.

December 6th. Wound closed, and only a superficial spot of granulation left. Paroxyms have not returned. Can open mouth and move jaw better. Pain, she thinks, is less.

December 18th. Patient very comfortable. No paroxysms since first five days after the operation. Pain in face less, and paralysis improving. Some tenderness about the face still, but wound all healed with a depressed cicatrix.

Discharged, relieved.

Second Operation. — June 29th, 1883.

Patient returns, complaining of having suffered severe pain at times, off and on, since discharge. Was discharged Dec. 18, 1882.

June 30th. Operation by Dr. Cheever. Ether given. An incision, about an inch in length, made over the angle of the right inferior maxilla, the dental canal opened, and the nerve for some distance destroyed. Wound left open and dressed with carbolic lint.

July 4th. Complains of occasional attacks of pain.

July 9th. Wound rapidly healing by granulation. Wound is dressed daily.

July 17th. Wound nearly healed up with granulations. Attacks of pain not so frequent or severe. Had a small boil coming on side of neck. Poultice ordered to boil.

July 20th. Boil on neck relieved. No attacks of pain for three days.

July 30th. Is feeling much better. Wound over nerve nearly full of granulations.

August 15th. Has had no spasms for two weeks. Complains of a creeping sensation at times. Wound contracting.

September 1st. Wound all closed. No spasms for a month. Has been up and about the ward for three weeks.

September 20th. Discharged, relieved.

For seven weeks after being discharged from the second operation she did well; then, as the cicatrix closed, pain returned in the same cheek, and for the last three weeks she has been sick abed with it. At first it came as a little twitch and jump running down the jaw, then shoots up into temple, head, and eye; whole right side of face very sensitive. Patient has a congested, sullen, and feverish expression.

She is urgent for a third trial by operation.

December 14, 1883. Etherized in operating-chair; head turned to left; a large horse-shoe flap through skin and fascia, from the ear to well forward on the zygoma in breadth, and down to the angle of the jaw in length, is cut and turned up. Next the masseter was cut across, scraped from its attachment to the bone, and reflected up toward the temple. Then a triangular segment of the jaw, including the coronoid process, and all but the condyle, and extending down to the hole opposite the inferior maxillary foramen made at the previous operation, is sawed out and removed. To remove this, a portion of the attachment of the temporal muscle was divided. The external pterygoid muscle now came into view, and this was cut through. The internal maxillary artery was cut, and both ends ligatured. Now retraction of the muscles and tissues showed the bifurcation of the gustatory and inferior dental nerves, and the main trunk leading up to the base of the skull. The whole within reach, main trunk, gustatory, and inferior dental and connections were cut off high up, and the bone around the foramen ovale scraped with a curette. In so doing, the small meningeal artery was wounded, as indeed its close proximity rendered probable it would be. It being impossible to ligature this vessel in the foramen, the troublesome hemorrhage was checked by packing the wound with an oiled cloth and absorbent cotton. After being bandaged the patient was put to bed.

Dr. W. W. Gannett, pathologist, to whom the excised nerve trunks were sent for microscopic examination, reported

that he failed to find in any portion evidence of degeneration of the nerves.

December 15th. Constant vomiting; no pain. Nutritive enemata not retained. Iced champagne given by mouth. Morphia subcutaneously (to which she had been accustomed).

December 16th. Much the same.

December 17th. Better; slept; ate cracker and milk. External bandage removed; flaps healthy; no bleeding. Vomiting being controlled, the packing was taken out, and was quite offensive; no hemorrhage. Cavity of wound three and one half inches deep; tissues healthy; syringed with fountain syringe, and dressed with carbolized charpie.

December 18th. Comfortable. Pain only from dressings.

December 20th. Takes food well; champagne omitted; sherry given, ʒ iv.

December 28th. Sloughs came out.

December 30th. Sloughs all out, wound healthy.

January 4th. Light dressing; flap allowed to unite.

February 20th. Wound closed.

March 3d. Up and about; cicatrized; no pain. Discharged, relieved.

On inquiry in 1888 she reports as follows: —

South Boston, Feb. 13, 1888.

Dr. Cheever: —

Dear Sir, — Your letter of the 8th I received, but was unable to answer then, for I am sorry to tell you my face is yet a great source of trouble to me. For the first year after I left the hospital I felt no pain. After that the pain came back, and troubles me a little all the time; but the real bad, terrible spells I have but seldom.

My mouth is closed, so that it is very difficult for me to eat. I am obliged to eat soft food all the time, and it is with great difficulty that I get it inside of the mouth.

I think there is about as much feeling in my face as ever, but no strength, and when speaking, I feel obliged to put my hand on my chin. I have told you as well as I can how my face feels, and I am greatly obliged to you for the relief you have given me.

Respectfully yours,

M. C.

Cancer of parotid gland infiltrating the neck; parotid gland and facial nerve removed; pyæmia; death.

March 1st. Sea-captain, aged 62, Eastport, Me. Was well until a year ago last summer, when a small tumor appeared in the right temporal fossa in front and above the ear. In January this was removed by a surgeon in Maine. Had no more trouble till September of the present year, when he began to have pain in ear, inside of face and head. A month later a lump appeared near the seat of the old tumor, which was followed by enlargement of the glands about the ear and in neck. Last December he was suddenly attacked with facial paralysis of the right side of face. Right eye open, and cannot be closed. Tongue deflected to the left. Sight in eye not affected.

March 7th. Patient allowed to go till to-day without any anodyne, in order to determine the amount of pain which he has. Is in constant pain, which is not relieved by any local application, though several were tried.

℞ Sol. Morphia, dr. 2 every four hours, s. o. s.
Brandy, oz. ½ every three hours.

March 8th. A consultation of Drs. Cheever, Gay, and Thorndike was held to-day. There was found to be a tumor of stony hardness behind the right ear, between it and the mastoid process, and extending around below the ear and up over the angle of the jaw to a point about three-fourths of an inch above the external auditory meatus. Another mass extended from this along the angle of the jaw to a point nearly opposite the lower border of the larynx. There were several hard nodules under the right ramus of the jaw, and the cervical glands were enlarged down to the clavicle. Just in front of the external auditory meatus was the scar of the old injury. It was thought that nothing like a radical operation could be undertaken, but that partial operation might remove the pressure on the facial nerve, and relieve the neuralgia.

March 10th. Patient etherized. Dr. Cheever made a Y-shaped incision from behind the ear to the middle of the neck, with the other arm from the same level in front of the

ear, meeting the first at about the angle of the jaw. The skin was dissected up to the meatus, which was divided and the flap turned up. A cut, about an inch long, was made at right angles to this, at about the articulation of the jaw. The parotid gland was found to be a solid mass of disease, and was dissected out as far as possible, beginning behind the external auditory meatus, and working forward till the whole of the parotid gland, with the exception of that portion which lies deep in behind the jaw, was removed. The space between the angle of the jaw and the mastoid process was cleared out, and the finger could feel the styloid process. The facial nerve was next sought out, and followed up to the stylo-mastoid foramen, where it was divided as close to the mouth of the foramen as possible. The posterior auricular artery was cut and tied, but the temporal was not disturbed. A large branch, possibly the internal maxillary, was cut deep under the jaw; it bled freely, but was finally secured.

At the lower end of the incision a large mass of disease could be seen extending down the neck, in the sheath of the vessels. All bleeding points were tied with catgut, and the incision closed, except at the lower part, with silk sutures. Edges came together nicely, and there was no hemorrhage to speak of. Dressed with carbolic oil.

March 11th. Patient very comfortable this morning; has none of the old neuralgic pain, and only a soreness in the side of his head. Temperature considerably elevated. Pulse, 132.

March 12th. Brighter this morning; temperature lower. Pulse, 108, and better strength. Wound suppurating a little, and the corner of the upper flap is a little dark colored. Dressed with charcoal poultice.

March 13th. Patient has erysipelas of the face. Has had pain in the great toe of right foot since the twelfth. Temperature elevated. Considerable fever. Fever mixture, dr. 1, every three hours.

March 16th. Right foot, from the toes to the ankle, red, swollen, œdematous. Dark red lines run up the leg, particularly over the course of the internal saphenous vein. Patient has had no chill, no diarrhœa. Temperature is elevated, but the curve is regular. Laudanum fomentation to the foot.

March 17th. Patient about the same. Brandy increased to oz. 8.

March 18th. Complained to-night of pain in the left elbow. The arm about the joint was red, swollen, and œdematous. Considerable induration, with a dark red line running up and down the arm. Poultice to arm and foot.

March 19th. The right elbow is affected to-day the same as the left. Poultice to it. The erysipelas of face has almost disappeared. The wound is open throughout nearly its whole extent, but the discharge is free and sweet. There is a very superficial slough along the edge of the ear.

March 20th. Left foot affected to-day in a similar way. Patient very uncomfortable, but takes his nourishment very well.

March 21st. The left foot and right elbow are much better; the swelling and redness are greatly diminished. The right foot and left elbow, though much better, are still much swollen, red, and œdematous. The swelling of the arm has extended into the hand, and the skin is blistered on the back of the arm. Patient takes a very large quantity of nourishment.

March 22d. The transverse cut on the cheek has healed. A small slough from the triangular flap. Upper part of both V-shaped incisions beginning to unite. General condition much worse. He lies in stupid condition and takes but little notice of what is going on around him.

March 23d. The arm is a trifle better to-day, but the swelling has, nevertheless, extended a little more up the arm. Complains of pain in both knees, but nothing seen on examination. Vomited once yesterday.

March 24th. Very restless to-day. No marked change. Temperature, 103.6; respiration, 44; pulse, 120.

March 25th. The slough has about all separated, except on the ear. Wound granulating. A large blister over the whole of the left heel. Temperature last night, 104°. This morning, 99°; pulse, 108.

March 26th. Both heels blistered. Swelling entirely gone from the legs. Arms about the same. Profuse discharge from the face. Wound very indolent; sore on tongue.

Abdomen distended and tympanitic. Enema of turpentine and suds. General condition very bad. Has much pain in the abdomen, and is very weak. Diminish food, and give all the stimulants he will take.

March 27th. Yesterday there was a hemorrhage from the wound over the mastoid process. Dr. Kingman was called and ligatured three bleeding points. About six ounces of blood were lost.

March 27th. No change in face and elbow this morning. Omitted poultice from face. Abdomen much more distended and very tympanitic. Has had no chills. Some constipation, and not much abdominal pain. Beginning to have involuntary dejections, and passes urine involuntarily. No appetite to-day, for the first time since the operation. Is evidently failing very fast, but has no delirium, and is perfectly conscious. Temperature this morning, 96°; pulse, 110; respiration, 50. Failed gradually through the day, and died at 5.20 P.M.

March 28th. Autopsy made this afternoon by Dr. Gannett. Patient was found to have died of pyæmia. There was pus in the ankles, knees, and elbows, and cloudy swelling of heart, liver, and kidneys. No peritonitis. No metastatic abscesses.

TUMORS OF TONGUE.

Cancer of Tongue. — J. L. M., mill operator, aged 67, widower, Germany. January 25th. About ten months ago patient noticed a burning feeling in his mouth. He could not see anything the matter. After a while he noticed a small red spot. Examination shows a red papillary mass, extending along the whole right side of the tongue. Little pain and discomfort felt.

January 30th. Condition the same.

February 1st. Patient etherized. Dr. Cheever passed a silk suture through tongue, and dragged it forward and up, cutting the raphe and vessels on the under side of the tongue.

Vessels tied with catgut. When the tongue was free, the ecraseur was passed back to the base and held by pins. A steady pressure was kept up for about a half-hour, when the whole anterior part of the tongue dropped off. There was considerable bleeding from the right side of the stump. Ferric alum and the cautery were used, and finally it was stopped with ice. Came out of ether well. Complains of difficulty in swallowing.

February 2d. Enemata of milk, oz. 2; beef extract, dr. 1; brandy, oz. 1.

February 3d. Doing well. Can eat with tube. Feels comfortable.

February 5th. Eats quite well. Has had considerable trouble from offensive discharge from the stump; but this is now fast disappearing.

February 6th. Stump looks very well. Patient about the ward.

February 9th. Considerable thick fœtid mucous discharge from mouth. Eats well; feels well.

February 12th. Discharge ceased.

February 15th. Stump of tongue all healed. Looks of a dark-gray color. No pain or discomfort. Talks fairly well.

February 19th. Discharged, relieved.

Cancer of Tongue: Excision. — C. McG., aged 44, widower. March 17th. Father died of Bright's disease. Has always been a hard drinker, and was in hospital three years ago for alcoholism. Was transferred to-day from the nervous side, where he was admitted a few weeks since for alcoholismus and epilepsy. Patient has had epileptic fits for about three years, at intervals, and has repeatedly bitten his tongue. Several weeks ago a hard tumor, the size of a large bean, appeared on the right side of his tongue in the cicatrix of the former lacerations Albumen, hyaline, and finely-granular casts were found in the urine before transfer. Dr. Cheever removed the tumor to-day, under ether. The growth was cut out with the knife, and the vessels either ligated or cauterized. Whole wound cauterized with the Paquelin cautery. The tumor itself was a hard nodule, imbedded in the muscles of the tongue, with a sharp outline.

℞ Myrrh Wash, one-half strength.

March 22d. Considerable suppuration, but wound cleaning off well, and looking very healthy.

March 25th. Ulcer contracting and granulations looking very healthy. To sit up.

March 28th. Wound healing rapidly. Has had no pain since he came to the surgical side.

March 30th. Patient is nearly well. Discharged, relieved.

Cancer of Tongue: Operation. — S. C. B., aged 72, married. February 23d. Never noticed anything the matter till about New Year's, when he discovered a small lump under the tongue. This has grown rapidly since then, and now involves the base of the tongue throughout its anterior portion. Has had but little pain. Considerable salivation. General condition very good. Says he is in perfect health. No history of cancer in his family that he knows of.

Examined by Dr. Cheever. — There is a mass at the base of his tongue and the floor of the mouth, consisting of nodules, and patches of ulcerations, as large as a horse chestnut. Glands not enlarged.

February 24. Dr. Cheever operated to-day under ether. Two V-shaped incisions were made along the lower edge of the inferior maxilla, meeting at the symphysis, and the flaps dissected back. The muscular attachments to the lower jaw were divided, and the tongue pulled down through the opening in the neck. It was then transfixed with long pins, and divided with the wire ecraseur. The remaining masses of induration were then cut out with the knife, and the hemorrhage controlled with ligatures and the cautery. A double suture was then put through the stump to prevent its falling back and suffocating the patient. The tissues on the inside of the inferior maxilla were scraped off, leaving the bone bare. After the hemorrhage was controlled, the upper part of the external wound was closed with silk sutures, and the lower part left open for drainage. The suture into the stump was sewed into the flaps to hold the stump forward.

Dressing of ice water to the cut wound. Patient came out of his ether well, and was comfortable till about 8 P.M., when he had a slight hemorrhage which stopped itself, but which frightened him somewhat. He complained of difficulty in breathing, and thought he was suffocating. Was relieved by spraying the throat with chlorate of potash.

February 25th. Patient very comfortable this morning. Slept considerable last night after about 11 P.M. This morning he swallows liquids without very much difficulty.

℞ Milk, or Beef tea, oz. 2.
Rum, oz. ss. ℿ. S. By enema every 3 hours.

Patient kept easy with morphia subcutaneously.

February 26th. Patient pretty comfortable. Has been kept free from pain with morphia, and nourished with enemata. Swallows a little milk and water, but with some difficulty.

℞ Milk, oz. 2.
Eggs, no. 1.
Brandy, dr. 4. M. By enema every 3 hours.
To alternate with enema of Beef tea, oz. 2.

℞ For mouth-wash:
Sol. Thymol.

March 1st. Patient had a slight hemorrhage last night, which stopped itself. It probably came from the flaps, which have been pulled apart by the restlessness of the patient. His temperature has come down to-day, and on the whole he looks better than he has since the operation.

March 2d. Patient not as well. Has slight hemorrhage from the flaps. Is very restless. Has the Cheyne-Stokes respiration this morning. Brandy increased to oz. 8 in 24 hours. Swallows much better, and takes considerable brandy and milk by mouth.

March 3d. Temperature normal last night; 99 this morning. Takes nourishment well. Stitches removed. No union at any part of the flap. Tongue sloughing badly.

March 4th. Temperature 101½. No marked change.

March 5th. Tongue sloughing badly. Tends to drop back. Patient has many attacks of dyspnœa from this cause. Is very restless. Cyanotic. Eyes fixed and glassy. Enemas not retained. Refuses to swallow.

March 6th. Gradual failure through last night and this morning. Loss of consciousness. Discharged, dead, 2.30 P.M.

Sarcoma under Tongue. — S. D. G., aged 56, married, farmer, Barnstead, N.H. April 9th. Patient states that he received a blow under the chin from a horse last December. He felt the injury considerably at the time, and there was much swelling under the chin. This swelling never wholly disappeared, and within the past few months it has increased rapidly in size, and is now about as large as a hen's egg. He now complains that the swelling begins to interfere with his swallowing.

Examination showed a hard indurated mass about the size of a hen's egg, situated deeply under the chin. It was adherent to the lower jaw behind the symphysis; and the finger could detect the growth just under the mucous membrane of the floor of the mouth.

Etherized. A longitudinal incision of about two inches and a half was made over the growth and through the superficial fascia. An area of inflammation was now reached which included the mylo-hyoid muscle. This was cut through and retracted, and under this could be felt a hard mass which seemed to be very adherent and infiltrating. It included parts of the hyo-glossus, genio-hyoid, and genio-hyo-glossus muscles, and was adherent to the posterior surface of the symphysis of the lower jaw. It also extended backward to the hyoid bone. The growth was dissected out as carefully as possible, and separated from the jaw by periosteum scrapers. There was considerable hemorrhage, which was checked. It was, however, found to be impossible to remove the growth without splitting the lower jaw at the symphysis. The lower lip was accordingly divided in the median line, the incision being made to connect with the previous incision made over the tumor. One of the middle lower incisor

teeth is now pulled, and the symphysis laid bare, and sawed through. The sides of the lower jaw are now retracted, and thus abundant room is obtained to dissect out all that is possible of the infiltrating mass. Hemorrhage free, but speedily checked. A mass about the size of an English walnut is removed. The symphyses are wired together with silver wire. The skin flaps are brought into apposition by silk sutures, a small space at the most dependent part of the flaps being left free from sutures in order to secure sufficient drainage. Patient's pulse and respirations have been good throughout all the operation, which lasted about one and one-half hours.

April 10th. Has not been able to swallow. Very restless. Brandy and beef-tea enemata.

April 12th. Can swallow a little. Wound looks well. Tongue not so much retracted.

April 15th. Has developed a blush on the left cheek, and his temperature has gone up. Can swallow. Mouth washed out with boracic-acid wash.

April 18th. Blush has spread over the forehead. Feels more comfortable. Good union secured about the chin.

April 22d. Blush disappearing. Wound looks well. General condition better.

April 29th. Doing well; sits up.

May 5th. Walking around. Eats well. Can generally make himself understood in conversation.

May 10th. Wound has closed. Jaw has united; wires removed. General condition fair. Some induration is still left. Discharged; relieved.

1888 — four years later — remains well.

THYROTOMY.

W. P., aged 6. March 6th. Two years ago a permanent hoarseness first called the attention of the patient's parents to the condition of the larynx, and to the disability which at

present exists. Gradually dyspnœa began to develop. Loss of the voice followed, and increasing difficulty of respiration, especially at night or after exposure to cold. There has been no noteworthy pain about the larynx.

The laryngoscope discovered a small tumor situated on the vocal cords, at or near their anterior commissure. Attempts to remove the growth through the fauces, with the aid of the laryngoscope, have been made by Dr. F. I. Knight, but the irritability of the patient rendered them unavailing.

At present there is complete aphonia and moderate dyspnœa, but it is represented to be more severe at times. Except these two symptoms, there is nothing to indicate any local or general affection. The child is in excellent health, and plays with freedom. The appetite is good, and the functions regular.

Operation. — Etherization was readily affected without much spasm or inconvenience. Tracheotomy was then performed, without any complication to hinder the operation. An incision was now made over the central line of the thyroid cartilage, from the hyoid bone to the upper limit of the tracheotomy incision. The thyroid cartilage was freely exposed; two small vessels in the corner of the dissection required ligatures. The cartilage was opened in the median line from its summit downward to the crico-thyroid membrane. As soon as the incision was made, a spasmodic movement of the larynx threw out the tumor as a whitish pultaceous epitheloid mass. The opening through the thyroid being kept patent by silver wires passing through the cartilage and held to either side, the growth was carefully snipped from the vocal cords and from its attachments. Its aggregate mass was about that of a marrowfat pea. It was attached at the anterior part of the larynx to the vocal cords, and to the adjacent region, effectually preventing the normal action of the cords. The surface of the attachment was lightly cauterized with nitric acid, its action being neutralized by Sol. Bicarb. Soda.

Throughout the operation the condition was very quiet, and nothing prevented its perfect success save free vomiting in the early part. The respiration was remarkably easy, in-

terrupted only by free expectoration of bloody mucus through the tube. The wound in the cartilage was united by three silver-wire sutures, and the external incision approximated by silk sutures.

Evening. Is very quiet, without pain. Respiration easy. Expectoration of bloody mucus, moderate in amount. Pulse, 120. Wound quiet. Milk *ad lib.*

March 6th. Comfortable, with but slight constitutional disturbance. Pulse, 112. No pain. Auscultation gives moderate mucous rales in both backs. Expectoration abundant, of tenacious mucus. Wound looking well. Sleeps tolerably well, but is somewhat restless.

March 7th. General disturbance somewhat more marked. Face flushed. Pulse, 120. Cough as before. No pain, or increase of thoracic symptoms. Wound quiet. Night rather restless, partially from obstruction of tube. Patient takes milk and broth freely.

℞ Pulv. opii c ipecac. gr. iij. Nocte.

March 8th. Patient is very comfortable, having passed a quiet night. Two sutures removed from wound. No union; edges open freely. Moderate discharge of pus. Coughs considerably. Throat not sore at all. Patient takes liquid diet freely. Bowels opened by enema; one free dejection. Pulse, 104. Tongue slightly coated. Repeat Dover's powder.

March 9th. Is very quiet and comfortable. No pain. The remaining external sutures removed. Wound gapes. By spasmodic action of the larynx, causing continued tension on the sides of the thyroid, the silver wires are partially loosened and fail to hold the edges in apposition perfectly. Wound granulating slightly at bottom. General condition excellent. Repeat opiate at night.

March 10th. Doing well as to general condition. Wound opening, widely exposing thyroid cartilage at the bottom. Wire sutures removed. Pulse, 100. Bowels opened by enema. Wound cleansed p. r. n.; and Liq. Sodæ Chlorin. Dil. applied. No pain or constitutional disturbance. Cough diminishing.

March 12th. Wound granulating. With each act of

swallowing the edges of the thyroid cartilages open widely, exposing the granulating surface of the larynx. Saliva and liquids escape in considerable quantity through the wound. Ligatures both away. Region of wound dressed with Ung. Zinc Oxide, to prevent excoriation. Patient complains of no pain. Appetite good.

March 13. A small portion of the thyroid cartilage has to-day ulcerated away and escaped through the wound, otherwise the condition is as before reported. One free dejection from enema. Pulse, 100.

March 15th. Doing admirably as to general condition. Respiration perfectly easy. No pain. Appetite good. Wound healing, with healthy granulations. In the act of swallowing, the cut surfaces of the larynx open, revealing abundant granulations covering the whole interior of the larynx. One free dejection every other day with enema. Sleeps without opiate. Very little fluid escapes through the wound.

March 8th. Wound closing fast, its base being seen with difficulty. The edges of the thyroid cartilage are in fair apposition, the cavity of the larynx being as before filled with granulations which extrude in deglutition. Patient in excellent general condition. Sleeps and eats well. No fluid comes through the wound.

March 21st. Doing well. Respiration excellent. Wound closing, with very moderate discharge.

March 22d. When the tube is closed, the patient can breathe through the larynx, but with some difficulty. Articulation is prospectively possible, sounds being moderately distinct in a whisper. Condition, in general, excellent.

March 24th. Doing well. Wound almost entirely closed above the tube. Remove tube. The operation was followed by severe paroxysms of coughing, the slight hemorrhage attending the removal and tearing of the granulations irritating the trachea and causing distressing coughing. The dyspnœa subsided shortly, and the patient breathed with great freedom, and is very bright and cheerful. The granulations above the tube-opening have at once closed in like

a valve, and respiration is almost entirely through the larynx.

March 28th. The patient has improved daily, and is now in splendid condition, breathing easily through the larynx, and in all ways is perfectly comfortable. External wound healing kindly. Voice whispering, and as distinct as before the operation. Appetite excellent. Laryngoscope reveals a small granulating patch on left false cord; larynx otherwise looks healthy.

April 1st. Patient sitting up, and in excellent condition. Exuberant granulations about wound reduced by nitrate of silver. Voice tolerably distinct, but still in whisper. Respiration easy; appetite excellent.

April 4th. Doing well. Wound healing well. Slight hoarseness. Discharged.

1889. The boy is now grown up; and remains well.

FRACTURE OF THYROID CARTILAGE; TRACHEOTOMY; RECOVERY.

R. McL., married, carpenter. December 11th. Patient very drunk. Arrived in police ambulance at 8.30 P.M., with this account from officers, and note from Dr. Bush: "Was run over or knocked down by a team, and has an injury to the neck. Spat blood when first seen."

Examination. — Abrasion over chin extends along the left ramus of jaw where it amounts to a wound. A light linear abrasion as of a wheel over left side of neck. Two contusions over vault of skull. Some swelling of the neck on left side.

The hyoid bone has its natural condition and position. Over left ala of thyroid cartilage is an area of great tenderness. Cartilage very compressible, and pressure is accompanied by a snap as of two surfaces hitching past each other. Larynx not displaced. Trachea normal. Voice was hoarse and gruff, with considerable exertion. Whispering much easier. Respiration was difficult. Great dyspnœa on

lying down and on exertion. Respirations accompanied by long-drawn, "croupy" sounds. Deglutition very difficult and painful. These symptoms increased during an hour, and Dr. Cheever was sent for. It was thought to be a case of fractured thyroid cartilage, and tracheotomy required.

Operation. — Patient strapped and tied into chair. No ether. Incision in median line, low down through skin and fascia. Dissection carried down to trachea, which was quite superficial. Tenaculum inserted on either side; wound held open with retractors, and three rings of trachea divided. Spreaders entered and tube inserted. Held by tape about the neck. External wound sewed. Not much hemorrhage. Little shock or pain. Put to bed in Ward K. Steam in room constantly. Atmosphere moist. Inner tube removed and cleared every three hours.

December 12th. Tube blocked once by blood-clot, but was removed by feather in time. Patient slept some. Coughed a little blood. Took considerable milk, and awoke from his drunk much surprised at the transformation in his affairs.

December 13th. Face and neck much swollen. Deglutition very painful.

December 14th. Discharge from tube very dry and scanty. Respiration at times difficult. Steam on neck all the time.

December 16th. Swelling of neck diminishing. Stitch removed from the wound over the lower jaw.

December 17. Swallows quite comfortably. Breathes easily, and is very comfortable.

December 18th. Sits up in chair. Can breathe and talk with orifice of the tube plugged.

December 21st. Tracheotomy tube removed. Respiration easy.

Slept well. No difficulty in breathing. Incision in trachea collapsed and granulating.

December 26th. Doing well. Incision entirely closed. voice hoarse and gruff.

December 27th. Discharged, relieved.

PERFORATING WOUND OF BACK OF TRACHEA; TRACHEOTOMY.

W. O'B., March 5, 1881. House-officer called at 6.15 P.M. The man was brought in by an officer who said that he was stabbed at about 5.15 in the Gerard House; that he was treated outside by Dr. Harlow. The man was found to have a wound on the left cheek, bisecting obliquely a line drawn from the left ala nasi to the lobe of the ear. From this wound a cut led directly backward to and through the lobe of the ear, and was continued backward in the same direction about one inch from the mastoid process. About one inch behind, and parallel to the ascending ramus of the lower jaw, was a scratch, about one and one-quarter inches long, running toward the wound, to be described below. The principal wound was about one inch long, is about one inch above, and parallel to, the inner end of the clavicle. Its inner end nearly reaches the median line; it passes down, in, and back about one finger's length, and perforates the posterior part of the trachea a little to the left. When the man came in the wound was packed with compress, and there was little external hemorrhage: he was spitting some blood, mixed with air; the lungs were clear. Pulse, 96; respirations about 20. The patient was given brandy subcutaneously; the packing was removed; the tracheal wound plugged by a sponge, and he was laid on his side to drain the wound. The hemorrhage, however, was excited by coughing, and the lungs gradually filled while waiting for a priest, whom patient had desired should come before any operation was done.

When ready for operation there were coarse and fine moist rales pretty thoroughly distributed. Pulse, 110; respiration, 38.

Operation. — Dr. Cheever performed tracheotomy, without ether, low down, and inserted a very long tube. After insertion the man coughed up a large quantity of blood, with instant and marked relief. Hemorrhage considerable. No vessels ligated. Reaction good. There was marked

emphysema over the clavicle and supra-clavicular space, and extending down on to sternum. A drainage-tube was put in the stab-wound.

Ordered: Liquid diet and brandy.
Hot moist gauze over tube.

March 6th. Somewhat improved. Lungs clearer. Can clear throat by coughing.

March 7th. Lies in about the same condition. Gets no worse. Cotton jacket on.

March 9th. Condition encouraging. Breathing comparatively easy. Complains only of slight pain in right side on coughing.

March 10th. Condition better than yesterday. Inner tube removed and cleaned. Free expectoration of seromucous character.

March 13th. Tube removed from trachea. The drainage-tube was removed on the 11th.

March 14th. Can speak very easily. Both wounds healthy. No emphysema.

March 18th. Sitting up in bed. Edges of wounds healthy. On solid diet.

March 20th. The tracheotomy wound not healed yet.

March 21st. Up and around ward. No air comes through tracheotomy wound. Both nearly closed in.

March 26th. Nothing new. Up and around ward now all day. Nearly ready to go.

March 28th. Discharged, well.

There was no hemorrhage from the large vessels in this case. A narrow knife avoided the carotid and subclavian vessels. The trachea was opened low down, and from behind. The œsophagus was not injured. The trachea wound healed without abscess or mediastinal infiltration. The long tube prevented bleeding into the lungs and emphysema. Recovery in three weeks is a remarkable result from such an injury.

THYROID TUMOR.

Large double bronchocele, weighing 10½ *ounces, excised; death from impaired inspiratory power, and from shock.*

The patient was a young man of strong frame, and 18 years of age. Tumor has been growing three years. For last few weeks has become very painful. He enters hospital to have it removed, if practicable; on inspection, a large oval mass is seen on each side of the trachea, with an isthmus between. It rises and falls with the larynx, in swallowing. The tumor is firm; not cystic; not overlaid by dilated vessels; eyes not protruding; heart normal.

December 29th. He was etherized without difficulty. Dr. Cheever first made an incision down the right side of the neck, from the larynx to the sternum, and parallel to the sterno-mastoid muscle. This, together with the sheath of the vessels, being drawn to the outer side, the right lobe of the tumor was enucleated as far as possible. In the superficial and overlapping portions this was comparatively easy, as the bronchocele was enveloped in a fine, but distinct capsule of connective tissue. As the deeper and inner portions of the tumor were attacked, the vessels became numerous. They were tied separately. The superior thyroid artery entering the right lobe at the upper part was as large as the radial at the wrist.

The tumor was very vascular, and bled at every slight puncture. The sterno-hyoid, sterno-thyroid, and omo-hyoid muscles, crossing the right lobe, were cut across, and the right lobe lifted out with but little hemorrhage. The pedicle over the trachea was strangulated by transfixing with a double ligature and tying. It was then cut away, and the stump cauterized with Pacquelin's cautery. In order to complete these manœuvres and get room, a cross cut was made over the trachea. A long incision was now made parallel to the left sterno-mastoid muscle, the three incisions now forming the letter H.

The left lobe was taken out in the same way as the right. Numerous vessels were found at the back of the growth.

The superior thyroid showed three large branches, and the inferior thyroid artery was also plainly seen and tied. The pedicle was tied off and cauterized. There was no hemorrhage. The amount of blood lost during the operation, from leaking and oozing, was considerable; but there were no rapid arterial losses, except a momentary one from the slipping of a poor pair of catch forceps. The pulse kept up well, until near the close. In tying off the left pedicle, a marked change in the breathing took place — it became stridulous, and the lungs filled imperfectly. When the bilobed bronchocele was lifted out it looked not unlike a pair of lungs. The lobes weighed five and five and a half ounces respectively. After removing the tumor, an enormous cavity was left. The pulsation of the great vessels was plainly visible, and just behind the clavicles the soft tissues over the pleura could be seen to rise and fall with each respiration. The longitudinal cuts were sewed up, a rectangular space being left in the middle, through which projected the thyroid and circoid cartilages, together with the stump of the tumor.

Brandy was injected subcutaneously and by enema. Heaters were applied, and the patient put to bed. He came out of the ether very slowly; the operation lasting between two and three hours. Shock was great; pulse rapid and feeble; respiration difficult. He rallied in the night to a marked degree. Toward morning restlessness supervened. Swallowing became difficult, without fluids getting into the trachea; wheezing respiration; whispering speech; temperature, 102.8; pulse, 134; respiration, 56. Larynx moves up and down each respiration; chest heaves, but does not fill; perfectly conscious; at times croupy breathing. Every form of stimulation and some sedatives resorted to, together with artificial warmth. Enemas repeated. House-surgeon called, and, by advice of Dr. Cheever, tracheotomy was done. It did not disturb the patient, as the trachea was projecting in the wound, and was easily opened. Relief to breathing considerable. He continued to sink slowly and steadily; and died quietly, at the end of twenty-five hours from the completion of the operation.

We have always been taught that hemorrhage was the

chief danger in operating for bronchocele by excision. This case proves that a very large, solid goitre can be removed without severe bleeding; or, indeed, any greater loss of blood than many operations, ordinarily successful, entail.

Death here was accelerated by something more than ordinary shock. I believe that it was due to the following causes: —

1. Injury to the left recurrent laryngeal nerve in tying off the pedicle of the tumor. This was shown by the marked change in respiration, and also the change in facial expression, appearing as soon as the last ligature was tightened on the pedicle of the left lobe of the bronchocele. The vessels having been tied separately where they entered the tumor, probably the pedicle could have been cut away, without ligature, safely. Any hemorrhage could have been checked with the cautery.

2. Injury by exposure, section, and irritation of small terminal branches of the pneumogastric nerve. The early difficulty in swallowing was probably due to this; and the shock also influenced the expansive power of the lungs.

3. The large exposure of the external surface of larynx and trachea would tend to produce secondary complications; so also would the proximity to the pleura.

4. In the removal of all large tumors from the neck, I have always believed the free exposure and chilling of the large and thin walled veins had an unfavorable influence.

5. The length of the operation deepened the shock; and was probably as depressing as a larger hemorrhage. The pathologist reports the tumor as presenting only the microscopic appearances of an enlarged thyroid gland. There were no cysts.

THE MECHANICAL EFFECTS OF ADENOID VEGETATIONS IN CHILDREN.

By FRANKLIN H. HOOPER, M.D.

THE MECHANICAL EFFECTS OF ADENOID VEGETATIONS IN CHILDREN.

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Of the children who are brought to the Throat Department a certain number have the facial characteristics shown in these pictures. (Figs. 1–6.)

Fig. 1.

Fig. 2.

Upon inspecting these pictures it will be observed that all the children have certain characteristics in common; namely, the open mouth, the vacant look, and the stupid expression. There is but one disorder, as far as I am aware, that can give rise to these peculiarities, for they are not accidental, nor are they due to negligence on the part of the patients. A large number of the children come with a history of having been scolded by their parents for keeping their mouths open, their inability to clear their nostrils, their inattention, their

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

peculiar manner of talking, and their stupidity. Yet the fault is not one due to the children, but to a trouble which the medical practitioner should discover and remove. The

long train of evils from which these children suffer have a mechanical origin. Their naso-pharyngeal cavities are blocked up with highly vascular, glandular growths, called *adenoid vegetations*, which prevent them from breathing through the natural respiratory channels, the nostrils. When the nature of the difficulty is recognized, and the growths are removed, the children begin a new life. But if the affection is unrecognized, and it is concluded that the children have "catarrh," and that "they will grow out of it," the results vary according to their vitality. Some of them, after struggling for years for air, are left with permament structural changes in the ears or in other regions of the body; others escape with good hearing, but carry through life ill-developed bones of the face, deformed upper jaws, and misshapen chest-walls; while still others, owing to their rugged constitution, and to the fact that the growths, in some cases, atrophy very early, emerge from their troubles in good condition. The great regret in these latter instances is that the children may have passed several months of each year with all the symptoms of a violent head-cold which might have been prevented by proper treatment. Although I have already treated this subject somewhat fully in two previous papers,[1] I make no apology for again calling attention to it. The affection appears to me to be a most formidable enemy of childhood, and one very important to detect and eradicate. Our New England climate is especially conducive to the development of adenoid growths, yet until quite recently the children were left untreated, since the true cause of their complaints was unrecognized. It is remarkable that a disease attended by such manifest symptoms, and presenting such a striking clinical picture, should have escaped recognition and treatment until the present generation. While its symptoms were fully described by observers in the early part of this century, their cause was wrongly attributed to enlarged faucial tonsils. Although but twenty years have elapsed since Wilhelm Meyer, of Copenhagen, fully described

[1] Adenoid Vegetations in the Naso-pharyngeal Cavity. Boston Medical and Surgical Journal, March 4, 1886. Adenoid Vegetations in Children: their diagnosis and treatment. Boston Medical and Surgical Journal, March 15, 1888.

this affection, his observations were not utilized in the practical manner they deserved until many years subsequently. Ten years ago, according to my own experience, the subject was not mentioned in many of the Throat Clinics in Europe, yet to-day it is there receiving the attention it merits. For some years, in my own special practice, I was guilty of neglecting to examine, by the digital method, the naso-pharyngeal cavities of small children, and more than one child has come back to me whose faucial tonsils I had removed, and in whom I found a large adenoid as the real cause of its symptoms. I have reason to believe that the first operation in New England for the radical cure of this complaint was performed by myself, in this hospital, June 11, 1885. Since that date, in my private and hospital practice, 240 children and young adults, of ages varying from eight months to sixteen years, have been operated upon under ether, in the manner I have fully detailed elsewhere.[1]

I do not propose, in this paper, again to enter into the history, or to speak in an exhaustive manner of the symptoms or treatment of adenoid vegetations. I intend merely to indicate how these growths, by offering a mechanical obstacle to the passage of air through its natural channels, during the most important years of life (as far as the development of the body is concerned), may lead to lack of development of the bones of the face, deformities of the upper jaws, irregularity of the teeth, misshaped chest-walls, deafness, and defective speech. When once established, some of these results persist through life, others may be removed or corrected by clearing the air-way; all of them could have been prevented by an early removal of the growths, whereby natural and free breathing would have been established through the nostrils. For what does it mean for an infant or a child to have its nasal breathing impeded? It means that it is being starved for want of air, and the younger the child, the more difficult it is for it to get air into the lungs through the mouth. The infant's mouth is completely filled by the tongue and soft parts — the tongue being much larger in proportion to the cavity of the mouth than in the adult. If its upper-

[1] Boston Medical and Surgical Journal, March 15, 1888.

air tract is in a normal condition, the infant's mouth is kept closed, not by any muscular effort, but by atmospheric pressure. It breathes, sleeps, and nurses noiselessly and without effort. But when air is prevented from flowing through the nostrils by an adenoid growth in the naso-pharynx, — for these growths may be congenital, — the lower jaw drops from its own weight, mouth-breathing results, the infant's breathing is audible and disturbed, especially when it is asleep; and when it attempts to nurse, it is obliged to release the nipple every few moments, since the suction-pump action of its tongue and buccal cavity cannot work unless the upper air-way be free. The infant's struggle for its nourishment, in some instances of obstructed nasal breathing, is sufficient to throw it into a violent perspiration each time it is placed at the breast or bottle, and it is often completely exhausted by its efforts. Disturbed breathing and disturbed nursing, then, are the first symptoms of an adenoid growth in infancy, — two functions, all will admit, of the highest importance to have in proper working order. The youngest patient I have operated upon for this complaint was an infant eight months old that was brought to me by Dr. Samuel Crowell, of Dorchester. Its respiration had been unnatural from birth, but, in addition, another symptom existed which, according to Dr. Clarence J. Blake,[1] is present in about 83 per cent. of the children who have adenoid growths. I refer to complications in the ears. This nursling had already had two attacks of purulent inflammation of the middle ears.

After the infant was etherized, the naso-pharyngeal cavity was cleared as freely as possible with the post-nasal forceps, the cavity being too small to allow using my index-finger for scraping purposes with any satisfaction. The operation was performed in June, 1888, and the fact that the infant was relieved of its oppressed breathing, and has remained well since, is sufficient proof that the growth was the cause of its troubles. I have little doubt in my own mind that, if this infant had been allowed to grow up with this mechanical obstruction to its respiration, its condition would have been

[1] Relation of Adenoid Growth in the Naso-pharynx to the Production of Middle Ear Disease in Children. Boston Medical and Surgical Journal, March 15, 1888.

as pitiable as that of many older children who have come under my observation, who had suffered for years with the same complaint, before it was recognized and treated. Once aware of the existence of this mechanical obstacle to nasal breathing, it does not require a very vivid imagination to forecast the effects which, in the course of time, it may produce in an individual if it is left *in situ*. These mechanical effects may show themselves on the inside as well as the outside of the body. On the outside of the body, they are chiefly noticeable in the shape of the bones and soft parts of the face, and in the shape of the walls of the chest. On the inside of the body, we can see the narrow nasal chambers, the deformed upper jaw, the high palatine and narrow dental arch, and the irregularity of the teeth. The *modus operandi* by which these deformities are brought about is evident. The naso-pharyngeal cavity being locked up, mouth-breathing results. The weight of the hanging lower jaw causes the face to become elongated. Lines and furrows are formed at the angles of the nose, mouth, and corners of the eyes, the cheeks are sunken and the nose is pinched. Dr. Henri Chatellier, of Paris,[1] has called especial attention to the deformities of the bones of the head and face, consequent upon obstructed nasal respiration. He points out that the air-cavities, as the frontal, sphenoidal, and ethmoidal sinuses, and the antrum of Highmore, being normally in communication with the air, cease to develop when the circulation of air through the nose is interfered with, and hence the dimensions of the face are altered. The lower jaw, which follows its normal development, often projects beyond the upper jaw, which is contracted in front, the upper lip being drawn up, while the hard palate, from the constant atmospheric pressure within the mouth, is pushed upwards, terminating in a sharp angle like the Gothic arch. I think there is a definite relation between these adenoid growths and the V-shaped palatine arch, which has never been appreciated in considering the acquired cause of irregularity of the teeth in children, and which I wish to emphasize. In my experience, the high-arched

[1] Des tumeurs adénoïdes du Pharynx. Paris. 1886.

palate is always present in typical cases of this complaint. Moreover, I believe it to be one of the earliest mechanical results of obstructed nasal breathing. Mouth-breathing being unavoidable in these cases, the constant pressure of the air inside the buccal cavity gradually, but surely, forces the hard palate upward.

By referring to Figures 7, 8, 9, 10, 11, p. 65, which have been taken from the casts of typical cases, it will be observed how, from a simple vaulting of the hard palate in the very young, it may go on and lead to marked deformity of the jaw and great irregularity of the teeth. The central incisors suffer the most, being in some instances rotated to such a degree that they stand at almost a right angle to the jaw. Many a child has had one or more healthy molars extracted, and has worn for years an ingenious mechanical device for correcting a crowded and irregular denture, while atmospheric pressure was constantly working against the efforts of the dentist. Whereas, if the growth had been first removed, the labors of the dentist would have been shortened and lessened, since, by establishing free nasal breathing, the undue atmospheric pressure would be removed from the inside of the mouth, and the teeth would come more easily into place than if the mechanical appliance were working against this force. The V-shaped arch is the most common deformity of the upper jaw; it may be congenital, and its association with low mental development is well recognized; but in these cases there is defective development of the cranium in general and its contents. Adenoid growths in the naso-pharynx may or may not be present in this class of cases. Through the kindness of Dr. Fernald, Superintendent of the Massachusetts Institution for Feeble-minded Children, I examined there the nostrils and naso-pharyngeal cavities of children of different grades who presented marked deformities of the upper jaw of the V-shaped variety. In a few of them there was no abnormality of the septum narium and no obstruction in the naso-pharynx. The majority showed great unevenness of the septum, with prominent bony or cartilaginous ridges running along its base. Adhesion between the septum and the inferior turbinated body was noticed in one case. Adenoid

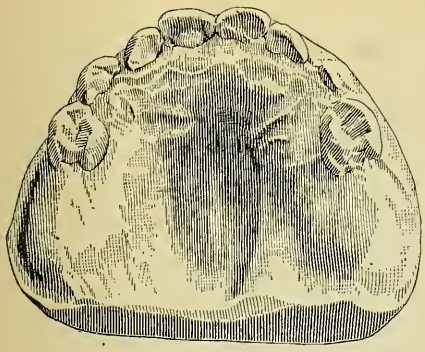

FIG. 7. Age, 2 yrs. 4 mos.

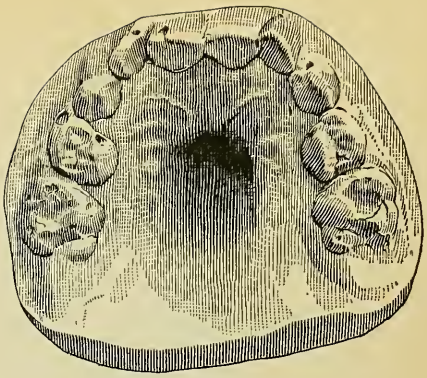

FIG. 8. Age, 4.

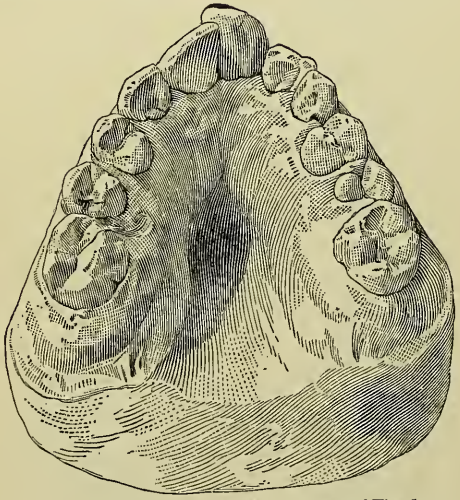

FIG. 9. Age, 10. Cast of upper jaw of Fig. 5.

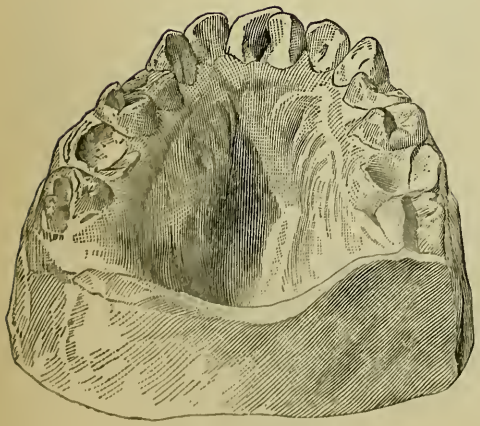

FIG. 10. Age, 15.

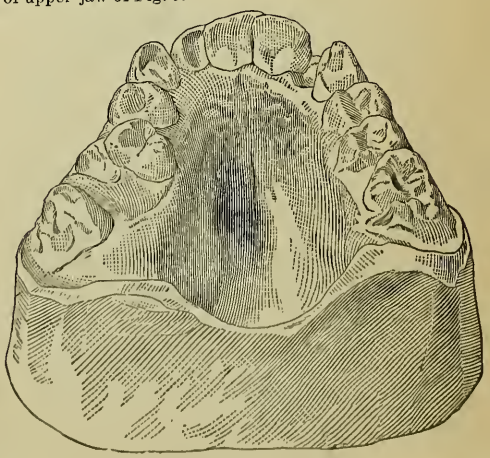

FIG. 11. Age, 16.

growths and enlarged tonsils were present in some of the children and absent in others. I failed to find, however, a single instance of what I should call a typical example of adenoid vegetations. The naso-pharyngeal cavities of some were abnormally long and narrow, and one choana might be found much smaller than its fellow. Certain irregularities in the region of the Eustachian orifices were also detected, but as we find such wide variations of conformation in this region, under the most normal conditions, I attached no importance to them. It is not within the scope of this paper to consider these cases of congenital idiocy, where the deformity is due to defective development in general, for there is no connection whatever, except a mechanical one, between adenoid growths and mental deficiency. Children with their nostrils completely obstructed, especially when they are deaf, have a stupid, and sometimes even an idiotic, mien. But they are not so in reality, for as soon as their air-tract is freed, their intelligence, expression, and whole nature, in fact, undergo a complete change. The brightest mind or disposition is severely handicapped by these growths. But it is a handicap which can be radically removed, and the earlier in life it is done, the more fortunate will it be for the child.

Another mechanical effect of adenoid growths is deformity of the chest-walls. This thoracic deformity is an indrawing of the chest-walls, resulting from an insufficient air-supply to the lungs, for mouth-breathers do not get the same quantity of air as those who breathe through the nostrils. The chest, in these cases, instead of being round and full, becomes flat and thin. It has a sunken appearance; the intercostal spaces being depressed, and oftentimes there is a deep concavity at the lower end of the sternum.

Figs. 12, 13, and 14, p. 67, show these appearances tolerably well. This kind of deformity of the chest was fully described as early as 1828 by Dupuytren, and again, in 1843, by Robert, but they attributed it, wrongly, to enlarged faucial tonsils. In fact, all the symptoms of adenoid growths have long ago been accurately described, but were laid at the door of the faucial tonsils. These tonsils, on looking into the mouth, could be seen; but the tonsil up behind the soft palate not

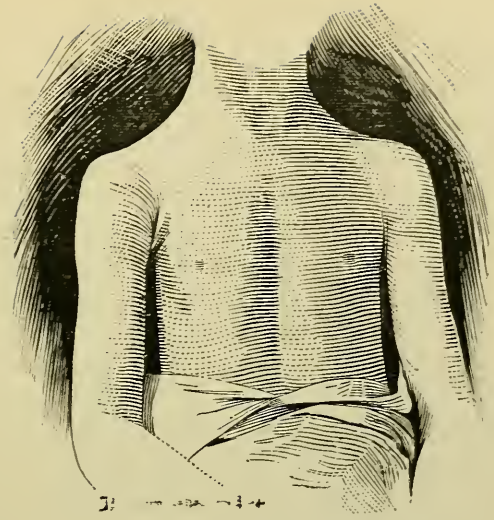

Fig. 12.

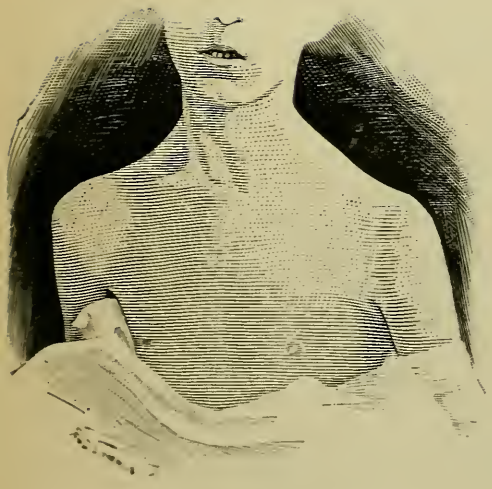

Fig. 13. Female. Age, 15. Cast of upper jaw shown in Fig. 10.

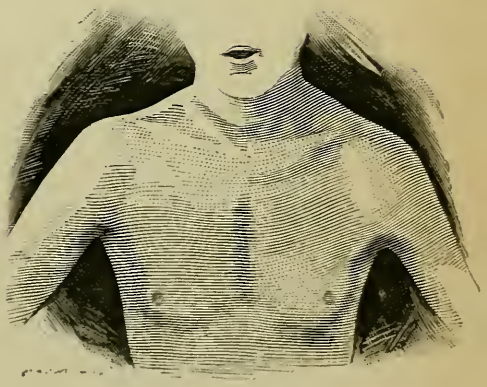

Fig. 14. Female. Age, 16. Cast of upper jaw shown in Fig. 11.

being seen, was not suspected of being, as we now know it to be, the real cause of all these symptoms. Dr. B. Löwenberg, of Paris, in one of the earliest and best monographs on adenoid growths,[1] first revealed the true origin of this thoracic deformity. He explains it by the theory that since the air does not enter the lungs, in these cases, in sufficient quantity, the atmospheric pressure on the outside of the chest becomes greater than on the inside, which, together with the labored action of the diaphragm and intercostal muscles in inspiration, causes the chest-walls to sink in.

The deafness from which a large proportion of children with adenoid vegetations suffer, may be produced in different ways. I wish here to call attention only to the mechanical relations of the growths to defective hearing; for I am inclined to agree with Mr. E. Creswell Baber, of Brighton,[2] in thinking that these growths mechanically interfere with the full action of the dilator muscles of the Eustachian tubes, which renders a proper separation of these walls at each act of deglutition impossible. Mr. Baber is of the opinion that this explains the immediate improvement in hearing which often results from a removal of the growths. The mechanical effect of the growths upon the speaking and singing voice is striking. The presence of the growths destroys the functions of the naso-pharyngeal cavity as a resonating chamber. The voice, therefore, instead of being clear, is thick, muffled, and stuffy, which is readily explained by the sound waves impinging on these soft, irregular growths, instead of on the smooth walls of the resonator. The quality of the voice in these cases has aptly been described as "dead," the nasal consonants "m," "n," and "ng," becoming "b," "d," and (hard) "g." To borrow a well-known example, the sentence, "The afternoon was fine, though the morning was rainy," becomes "The afterdood was fide, though the bordig was raidy." Sir William Dalby, in a paper on this subject,[3] points out how familiar Dickens was with the peculiarities of voice which mark the subject of adenoid vegetations.

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[1] Tumeurs adénoïdes du Pharynx nasal. Paris. 1879.

[2] British Medical Journal, Sept. 15, 1888.

[3] The Lancet, Oct. 2, 1886.

Dickens, Sir William says, must have come in contact with some of them, when he so accurately reproduces the voice in one of the characters of "Oliver Twist." There he makes the boy Barney (one of Fagin's gang) say, "Stradegers id the next roob," and "Ah! ad rub' uds too, from the cuttry, but subthig in your way, or, I'b bistaked." The facial peculiarities of adenoid vegetations are still more familiar

114 PUNCH, OR THE LONDON CHARIVARI. [SEPTEMBER 8, 1888.
WHAT OUR ARTIST (THE INTENSELY PATRIOTIC ONE) HAS TO PUT UP WITH!
Just as he is pointing out to Monsieur Anatole Duclos, the Parisian Journalist, how infinitely the English type of female beauty (especially amongst our Aristocracy) transcends that of France, or any other Nation,—who should come up from the beach but Lady Lucretia Longstaff, and her five unmarried daughters!
"—AND AS FOR THOSE IDIOTIC OLD FRENCH CARICATURES OF LES ANGLAISES, WITH LONG OAUNT FACES, AND LONG PROTRUDING TEETH, AND LONG FLAT FEET—WHY, GOOD HEAVENS! MY DEAR DUCLOS, THE TYPE DOESN'T EVEN EXIST!"

than the defective speech, and these have been portrayed by the caricaturist, without his suspecting, undoubtedly, that the appearances were the result of a mechanical obstruction to nasal breathing, and not a freak of an unkind nature.

The above illustration from a recent "Punch" is an instance in point. This drawing is not a caprice of a clever artist, but depicts a facial expression which is not confined to one country, although much more frequently seen in certain

localities. The damp climate of the British Isles favors the growth of adenoid vegetations, and in that country, as in our own, the recognition and treatment of this disease has, until quite recently, been sadly neglected. Any one who has travelled in Great Britain must have been struck by the prevalence of deformed upper jaws and irregular dentures, among both males and females, which are all the more striking by being alongside of the most perfect specimens of physical beauty. That a potent factor in the causation of this facial deformity is the force of a misdirected column of air during the years of life when developmental nutritive changes are the most active, is tolerably evident.

I have seen the effects of adenoid growths brought prominently in relief in children of the same family. The child having the growths presenting the stupid look and all the other characteristics of the complaint, and being the butt of the family, while its brothers and sisters, with no mechanical obstacle in their air-tracts, were well-developed and handsome children. The treatment of this affection is most satisfactory. The method I prefer has been fully described in a previous paper.[1] When the growths are present in large quantities, an anæsthetic should be administered, if it is desired to free the cavity thoroughly with the least shock to the child. The consistency of the growths varies greatly, and in many cases the finger-nail alone will effectually scrape them away. My rule, however, is to remove the greater portion of the mass with the post-nasal forceps, employing a slightly twisting movement with traction, and afterwards use my index-finger to smooth away the remaining masses of tissue. This operation should be carried out by all surgeons who are brought into contact with the disease. Those who have delicacy of manipulation, and who have had instruction in the affections of the naso-pharyngeal cavity, and have been taught how to examine it, and to work in it, will not find the operation, in the majority of instances, a difficult one. When properly done, it is not attended by any danger to the child. The growths do not recur. Perfectly innocent in themselves, by mechanically obstructing the air-tract, they

[1] Boston Medical and Surgical Journal, March 15, 1888.

may lead to results which may truly be called malignant. I therefore wish especially to urge the early removal of these growths from the child, and to protest against waiting for the child "to grow out of" the growths.

As knowledge of the diseases of the naso-pharyngeal cavity, and of this affection in particular, is diffused, that misleading word "catarrh" will no longer be applied to adenoid vegetations. It should make us alive, moreover, to our responsibility, if we defer active treatment in typical cases, on the supposition that the children will "grow out of it," since, by our neglect to remove the growths, there is a risk of permanent damage to important functions which may embitter the subsequent lives of these children.

NEW SURGICAL APPLIANCES.

By Francis S. Watson, M.D.

THE PERINEAL DRAINAGE-TUBE.

The perineal drainage-tube, which the accompanying cuts illustrate, was designed to secure thorough drainage of the bladder after external perineal urethrotomy, whether this operation be performed for stricture of the urethra, or as a preliminary step in the removal of bladder tumors, or for prostatotomies or prostatectomies, or for perineal cystotomy for any cause.

The essentials in such a drainage-tube were considered to be, first, a thin wall and a large calibre. These are obtained by making the tube large and of thin hard rubber. Second, cleanliness and ease in keeping clean. Placing a large eye close to the end of the tube, so as to have no cul-de-sac beyond it, and the polished surface of the hard rubber accomplish this. Third, the tube must have such a curve that its bladder end shall occupy the lowest part of the bladder; while the outer end shall lie in a parallel plane to the bed when the patient is on his back; the intermediate shaft must fit the direction of the posterior urethra between the vesical orifice and the perineal wound.

To establish this curve, measurements were taken upon twenty cadavers (soft metal being used for the purpose). The shape and direction of the tube, as seen in the figures above, represents the average result of these measurements in an adult between the ages of 30 and 50.

Fourth, inasmuch as the distance from the outer surface of the perineal wound to the bladder orifice varies more or less, owing to individual peculiarity, or to prostatic hypertrophy, and consequent lengthening of the prostatic urethra, — and further, as the depth of the bas fond below the vesical ori-

fice also varies in different instances, it was necessary, to meet the first indication, that it should be possible to shorten or lengthen this distance, at will, to suit the individual case.

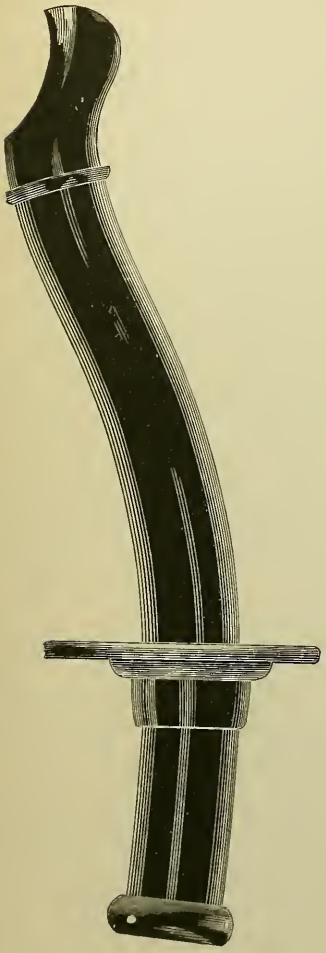

Fig. 1.

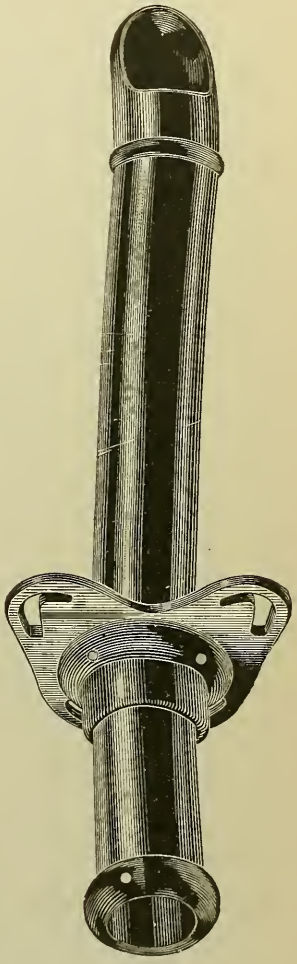

Fig. 2.

This is secured in the construction of the plate and collar which surrounds the tube, which can be pushed forward or backward on its shaft by exerting some force, but will stay at the point at which it is placed.

To drain a deep bas fond, such as often occurs behind a

median prostatic enlargement, the curved end of the tube which lies in the bladder is made longer in some of the instruments.

Fifth, the collar is made to fit the perineum, and has slots through which tapes are passed, to which it is secured to a waist-belt.

Sixth, to guard against hemorrhage, as, for instance, in the course of the urethra after prostatotomy or prostectomy, some of the tubes have been made with a ridge just above the eye, so that they can be used as a *canula à chemise*. A raised edge at the outer end of the tube allows a bit of tubing to be attached, through which the urine can be led into a urinal.

The practical application of these tubes has been made in three cases, — one of bladder tumor, one of prostatotomy, and one of external perineal urethrotomy for stricture. In all, it has given great satisfaction, and has been entirely comfortable to the patient.

Where hemorrhage from the bladder is liable to be abundant, as after the removal of a bladder tumor, the large, smooth-sided tube gives great comfort by keeping the bladder free from large clots that form in it.

Of the cases in which this drainage-tube was used, it was worn in that of stricture, for two days, with entire comfort. The patient had no constitutional disturbance. The wound healed in eighteen days, when he was discharged, well, and able to pass a thirty-two (French) sound readily into the bladder.

In the case of the bladder tumor, the tube was worn for four days, keeping the bladder free from clots; the bleeding then having ceased, it was removed. There was a good deal of pain from vesical tenesmus for the first twenty-four hours after the operation, then the patient was entirely comfortable. The wound healed in eighteen days also, and the patient went home well at the end of three weeks.

In the third case, that of perineal prostatotomy, there was a good deal of pain for the first three days, apparently due to the presence of the tube. It subsided, however, at the end of that time, and the patient continued to wear the tube for

the greater part of each twenty-four hours, for six weeks, it being desired to ensure a permanent perineal opening.

These drainage-tubes are made of different calibres and lengths, and with or without the ridge, which permits of their being converted into a *canula à chemise*, according to the special indications in each case, and can be procured at Messrs. Codman & Shurtleff's, No. 13 Tremont street, Boston.

THE ANTISEPTIC TIN DRESSING.

A form of dressing which has been found useful in the Out-patient Department is that known as the "tin dressing." It was suggested and used some years ago by Prof. Henry J. Bigelow. Its object is to secure a more rapid healing of granulating surfaces, of which the out-patient service furnishes an immense number and variety, and has, therefore, given an extensive opportunity to test its practical value. This has resulted in a decided conviction of its worth. As an example of its method of application, let us take an ulcer of the leg. The leg is washed with soap and water; then soaked for ten minutes in a warm corrosive sublimate solution, and thoroughly cleaned and dried. The surface of the ulcer is then dusted with iodoform or calomel, or whatever antiseptic one may prefer. Upon it is then laid a sheet of smooth mackintosh (which has been sterilized), somewhat larger than the ulcer. Upon this a piece of sheet-tin, also a little larger than the ulcer, and also sterilized. Upon the tin is placed an ordinary large and evenly applied dry, sterilized or corrosive sublimate gauze dressing, covering a large surface of the leg. This is bandaged firmly in place. The dressing is changed only when the discharge from the ulcer is seen to have leaked through, and often remains undisturbed for ten days or two weeks. What the tin seems to accomplish over and above the dressing without it, is, to bring the granulating surface to a level with the surrounding skin, or *vice versâ*, which seems to favor the shooting across, over the surface of the ulcer, of the epithelium. Professor Bigelow, in speaking of this process, likened it to the freezing of a sheet of water, which takes place more rapidly when its surface is smooth and level than when thrown into irregularities.

Another favoring element to healing is the apposition of the smooth surface of the mackintosh to the granulations, because when it is removed it does not carry off upon it the delicate epithelial cells, which *are* caught in the meshes of gauze or cheese-cloth, etc. However this simple contrivance may act, we are convinced that the rapidity of healing of granulating surfaces is greatly promoted by it in most instances.

THE BURIED SUTURE.

It is often desirable to reduce as much as possible scars resulting from cutting operations. This is especially true where they occur on the face or exposed parts of the body. The small punctures made by the needle on either side of the wound are often quite as disfiguring as the wound-scar itself. A buried catgut suture, which has been used in the Out-patient Department during the last two years, avoids the disfigurement just mentioned. Its only drawback is, that it requires more time to apply than the ordinary suture. Its application is illustrated in the accompanying figure (3).

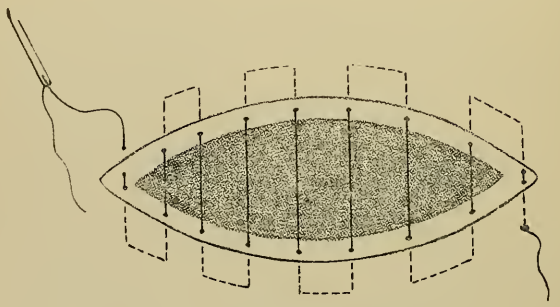

Fig. 3.

In using it the chief points to be observed are, to insert the needle just beneath the superficial layer or epidermis each time that a stitch is taken, otherwise the edges of the wound will not approximate evenly. If this is done, however, the resulting cicatrix gives a minimum of disfigurement. This suture has been used now in the many cases of scalp-wounds, the removal of wens and moles from the face, fatty tumors.

etc., the wounds healing by first intention with the production of very small scars.

IRRIGATION CLOTHS FOR THE OPERATING-TABLE.

The introduction of irrigation and the use in large quantities of antiseptic fluids, during the course of surgical operations, has called into use various devices for protecting the patient from their contact, and for leading them off from the operating-table to the floor, or into suitable receptacles.

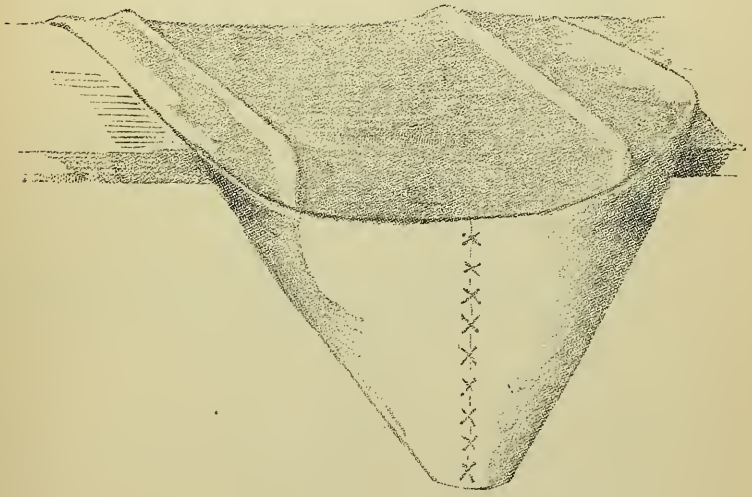

Fig. 4.

Operating-tables having the form of troughs, and covered with suitable rubber cloths, accomplish these ends, but oftentimes place the patient in faulty positions, and do not allow of the free change of position that is desirable. A plain, flat surface, on which the patient may lie, is therefore preferred by many surgeons. To meet the required ends in a simple and inexpensive way, adaptable at will to various operations upon different portions of the body, the plan illustrated in the accompanying cuts is suggested.

In the contrivance shown in Fig. 4, the two essentials are air-cushions or solid caoutchouc bars, two in number, having

a diameter of from one to one and a half inches, their length being that of the width of the table. Each end of the cushion or bar is provided with a strap or stout cord, whose ends, carried beneath the table and fastened one to the other, serve to secure the cushions or bars at any point across the table where it may be desired to place them.

Secondly, a rubber sheet, which is placed upon the cushions or bars, the ends of which, as they fall over the sides of the table, are cut in such a form that, when their outer edges are brought together and tied by tapes arranged for the purpose, they form a cone, the larger end of which is just at the edge of the table, while the smaller one reaches nearly to the floor, on to which, or into a pail placed upon it, it conducts any fluids which reach the upper mouth of the cone. With a rubber sheet sufficiently long to cross in a plane surface the operating-table, and to terminate on either side of the table in a wide-mouthed cone, which leads to the floor, placed upon the previously described rubber caoutchouc bars, the fluids which are carried upon this surface, bounded above and below by the rubber bars, must find their way into the cones and secure perfect drainage from the table.

According as more or less of the patient's body requires to be exposed in any given operation, the rubber bars or air-cushions can be placed farther apart or nearer together. In a laparotomy, for instance, the lower cushion would be placed beneath the gluteal fold, the upper one about the level of the tenth rib, beneath the patient.

This arrangement for draining the table during surgical operations cannot be used in operations upon the upper or lower extremities, when they are removed beyond the limits of the operating-table; otherwise, it may be used in any operation.

The device illustrated in the last figure (No. 5) is intended to supply drainage from the table in operations upon the perineum, the buttocks, and their neighboring parts. It consists of a rim of caoutchouc (*a*) rising about one and a half inches above the surface of the table, the ends of which (*b b*) are made narrow as they enter the cone (*C*), to allow of their bending readily over the table's edge. Between the

upright sides of the caoutchouc rim is a flat surface of rubber (*D*) which is continuous with the surface of the cone, and firmly cemented to the caoutchouc rim throughout its extent. The buttocks of the patient are placed upon the flat rubber surface, between the sides of the rim, and all fluids, of necessity, find their way into the cone, and a re-

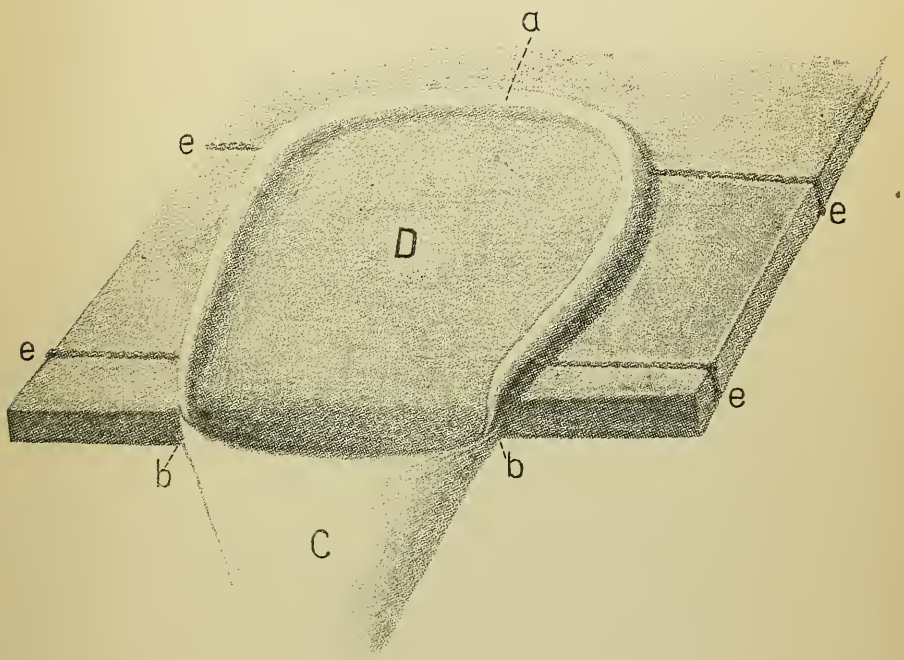

Fig. 5.

ceptacle placed beneath its open end to receive them. In order that the apparatus may not move from side to side as the patient is moved upon it, chains (*e e e e*) are provided, which attach it firmly to the table. The contrivance is too clumsy to carry about to private operations, but is well suited for hospital use.

THE "RIGHT ANGLE" CONTINUOUS INTESTINAL SUTURE.

By H. W. CUSHING, M.D.

THE "RIGHT ANGLE" CONTINUOUS INTESTINAL SUTURE.

By H. W. Cushing, M.D.

I have for convenience classified intestinal sutures as follows: —

1. Continuous. — Gély; Gély, Packard's modification; Appolito; Appolito, Smith, J. Grieg, modification; "glovers'" or "herring-bone;" Dupuytren; Kürschner; Lembert; Lembert, two modifications; "Right Angle," buried; Bertrandi.

2. Interrupted. — Jobert; Bishop; Lembert; Le Dran; Velpeau; Vezien.

3. Combined. — Czerny; Gussenbauer; Halsted.

4. Those requiring especial Appliances. — Dedans; Neuber; Madelung; Béranger-Féraud; Reybard; Jobert, Senn's modification.

The ideal intestinal suture is the one which combines greatest rapidity in formation with maximum security from extravasation of intestinal contents. To fulfil these requirements, there must be exact adaptation of wound edges and an accurate apposition of serous surfaces. Also, simplicity in construction: since ease in application means rapidity in operating; and adaptability to general use demands a technique uncomplicated, readily understood, and requiring only such materials and instruments as are commonly at hand, or easily to be obtained.

A short experience with the above-mentioned types demonstrates that the "Continuous" sutures have a great advantage in regard to the ease and rapidity with which they can be inserted. The time spent in knotting a fine wet thread, with fingers sticky with blood, in an intestine which is more difficult to handle than a wet rag, is surprisingly long.

It is true that some of the "Interrupted" sutures are usually firm, accurate, and handsome; but the extra time required to tie twenty or thirty knots is a very important factor in the success of the operation, and is much greater than a surgeon, when his patient is rapidly approaching collapse, cares to consume if he can possibly avoid it. My experiments and observations at operations on the living subject favor the conclusion, that an intestinal wound can be closed from one-third to one-half more rapidly with a continuous suture than by any other form I am cognizant of. Its alleged dangers are, that it causes stenosis by diminishing the diameter of the intestine.[1] That from one portion becoming free in the intestinal canal in advance of the rest irregular tension results, by which the integrity of the recently united wound is endangered. Actual experience has failed to substantiate such assertions.

Many experiments, and an extended investigation of the best sutures now on record, convince me that the struggle for the first place is practically between the "Interrupted Lembert" and one I shall call the "Right Angle" Continuous: all others being out of the field, either on account of their complex character, or the length of time and especial appliances required for their formation, notwithstanding that several, when once set, are very satisfactory.

Of these two rivals, the "Interrupted Lembert" (Figs. 1 to 6) is so well known that a detailed description is unnecessary. When inverted so that the knots are buried (Figs. 5, 6), it has a much neater appearance than as usually set.

The "Right Angle" continuous suture is a modification of the Kürschner (Fig. 11), or the "Continuous Lembert" (Figs. 13, 14). The manner in which such a continuous suture can be varied is shown in Figs. 7 to 15. With the exceptions of the "glovers'" (Fig. 12) and the Kürschner, which penetrate the lumen of the intestine, the mucous membrane is not involved. A study of these possible variations (Figs. 16 to 21) resulted in the conclusion that the "Right Angle" was preferable to the others. It excels not

[1] Czerny.

only in neatness of appearance, but also in accuracy of wound union. It is not only a continuous, but also a "buried" suture. Attracted to this suture by this comparison, I have made extended tests of it in the living and dead intestine. The results of these experiments have developed the suture[1] shown in Plate I.

It is inserted for uniting longitudinal wounds, as in Figs. 22 and 23. The most satisfactory results are obtained in the human intestine by placing the points of puncture one-eighth of an inch (3 mm.) apart, and by burying the suture to the same extent in a direction parallel to, and three-sixteenths of an inch (4–5 mm.) distant from, the wound edge. The suture terminates in the tough, fibrous submucous layer, and is not intended to involve the mucous membrane or penetrate the intestinal cavity. Each part of the suture should be drawn tight, so as to accurately appose the wound edges before the next is set.

A resected intestine is united by the same suture, but formed as follows: It is begun at one side of the mesenteric attachment by an inverted Lembert suture,[2] which is tied, and the free end (Fig. 24, *a*) left pendent from the knot.[3] The resected edges are now united by the "Right Angle" suture, which is inserted in the same manner as in a longitudinal wound commencing at the point of union already made, crossing the mesenteric attachment (Fig. 25), and continued along parallel to the resected edges of the gut,

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[1] Reported at the meeting of the Surgical Section of the Suffolk District Medical Society, held May 5, 1886.

The Process of Repair after Resection of the Intestine and Intestinal Suture. J. Collins Warren, Trans. of the Amer. Surg. Ass., May 12, 1887, pp. 142, 144, 146, 151.

[2] Wölfler. Resection of the Pylorus.

[3] By commencing the intestinal suture at one side of the mesenteric attachment (as above described), that portion of the wound is united first, and at a time when it is most accessible. Since this is the most difficult point to unite securely, and therefore the one at which subsequent extravasation of intestinal contents is most apt to occur, the advantage of this is self-evident. The danger from not closing this portion of the wound accurately cannot be too greatly emphasized. Also, when completing the suture, the operator can make the last few punctures and tie the final knot in full view, at a point easily accessible, instead of at one so concealed and difficult of access as that portion of the wound about the mesenteric border, the site commonly selected for completion of these sutures. This advantage will be readily appreciated by those who have followed the usual method.

till the free end (Fig. 24, *a*), at the point of commencement, is reached. The union of this end (*a*) to that bearing the needle by a square knot (Fig. 26) completes it. The free ends are now cut close to the knot,[1] which sinks out of sight between the approximated serous surfaces. When completed, the resection wound has the appearance shown in Plate I. The mesentery is now united by inverted Lembert sutures, interrupted, set on each peritoneal surface (Fig. 27).[2] This makes the neatest closure, the wound having the appearance above referred to (Fig. 6; Plate I., Fig. 1).

If rapidity in operating is imperative, the mesenteric wound can be closed with the ordinary form of interrupted suture.[3]

Such is the character and technique of the "Lembert," the most popular suture of to-day, and the "Right Angle Buried Continuous." Both have advantages to support their claim to the title of "best." Both have disadvantages which weaken such claims. The following comparison is, I believe, a concise and just statement of their true value: —

INTERRUPTED LEMBERT.

DISADVANTAGES.

1. Large number of separate knots, causing a *marked loss of time*. A most serious objection.

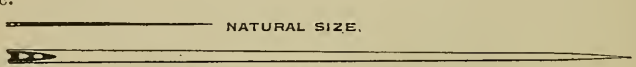
[1] If silk, $\frac{1}{10}$ inch (2 mm.) long.

[2] A very thin mesentery is best sutured by the ordinary interrupted suture.

[3] A continuous suture is unsafe for this purpose, since it is liable to relax and allow the mesenteric wound to open, as was demonstrated at the autopsy of a patient whose mesentery was united in this manner.

Fine white silk "Machine twist," J. D. Cutter & Co., aseptic by boiling, and preserved in alcohol-sublimate solution, is the suture I have found most satisfactory.

The best needle is a "self-threading" or "patent-eyed" one of German manufacture.



Trade name: "Nähnadeln mit federndem Oehr, Halblang, 8." This is a round sewing-needle, $1\frac{1}{16}$ inches long. By having this ground flat like a "Hagedorn" I obtained an instrument which combines all the advantages of the round needle usually recommended, and is far superior to it, from the ease with which it traverses the intestinal wall.

2. The sutures separate during distention of the intestine.[1] The inverted edges become narrower by this stretching, and are then in danger of everting and prolapsing outward between the sutures. Fæcal extravasation thus becomes possible.

3. The numerous knots cause more extensive adhesive inflammation and adhesions, which can cause subsequent danger by intestinal strangulation.

ADVANTAGES.

1. It is the simplest and most easily understood suture known; the chief reason for its popularity.

2. It also closes the wound (if properly applied) very accurately and firmly.

"RIGHT ANGLE" CONTINUOUS.

DISADVANTAGES.

1. Not quite so readily learned.

2. "Causes moderate constriction when used to unite resection wounds, if much intestinal distention." Probably a theoretical danger. I have found no record of such a complication with a continuous suture. My own experiments on the living intestine confirm this. The continuous suture has been successfully used in living human intestine.[2] This tension is an advantage, since the "constricting" circle is during distention more deeply buried (Fig. 28), thus approximating more extensively the inverted serous surfaces through whose union mainly fæcal extravasation is averted. With the Lembert the reverse is true.[3]

Fig. 28.

[1] From 2–3 to 6–7 MM. Reichel. Deutsche Zeitschr. f. Chir., Bd. xix, 230, 287.

[2] Rydygier. Berl. Klin. Wchnschr., 1882, 577.

[3] Interrupted Lembert, Disadvantages. 2.

3. Danger of septic infection, and suppuration along the track of the suture while being cast off into the intestine. Theoretical. I can find no record where this has happened to a continuous suture ; and experiments on animals show that sutures may be partly thrown off and hang free in the intestine without causing septic inoculation of the wound, which has united long before the suture is thus freed, which requires from two to three weeks.

ADVANTAGES.

1. It is the smoothest, neatest suture, thus reducing adhesive inflammation to a minimum.

2. With some practice it can be applied easier.

3. It can be applied *more rapidly than any other suture.* Of great importance.

One of many trials is the following : —

Resection of human ileum.

Lembert suture required fifteen minutes.

Continuous "Right Angle," two experiments, five, nine minutes.

I have united a resected ileum in the living human subject in eight and two-thirds minutes.

4. The greater the tension, the closer the edges of the wound are approximated.

5. It can be interrupted at any point, if desired.

6. It can be reinforced by another superimposed, if any point seems insecure, either by itself or an "Interrupted Lembert."

CONCLUSIONS.

That the most satisfactory suture, in all respects, is the "Right Angle" Continuous, reinforced by a similar one superimposed, or by an "Interrupted Lembert," if isolated points only require to be secured.[1]

If the suture is properly made, this reinforcing will be, as a rule, unnecessary.

[1] How far Senn's method of protecting intestinal sutures with omental grafts (Annals of Surgery. Reprint. 1888. P. 77) will render these superimposed sutures unnecessary, I cannot say from personal experience. It is a suggestion worthy of trial.

These conclusions have been formulated from data obtained by an extensive review of the literature of the subject, from careful and extended experimentation with living cats and dogs, practical tests and experiments with various sutures in dead human intestine, and from personal observation of intestinal resections during four years of hospital-work.

The reasons for the above conclusions are, —

1. This suture does not involve the mucous membrane.
2. The intestine is closed by a suture, which acts so that the greater the tension to which it is subjected the closer it is drawn.
3. It can be inserted more rapidly than any other.
4. It is impervious and efficient.
5. It is simple.

To the surgeon who has not investigated the subject, I would recommend the "Interrupted Lembert." He is *less* liable to go astray, and successful results are possible. But I would also tell him that some day his success will depend on whether he can complete his operation within a limited number of minutes. It will be a close race for a patient's life between shock and his skill. The advantage he will then gain with the "Right Angle" suture at his command will well repay the comparatively small amount of time and patience it cost him to acquire it.

PLATE I. — THE "RIGHT ANGLE" CONTINUOUS INTESTINAL SUTURE.

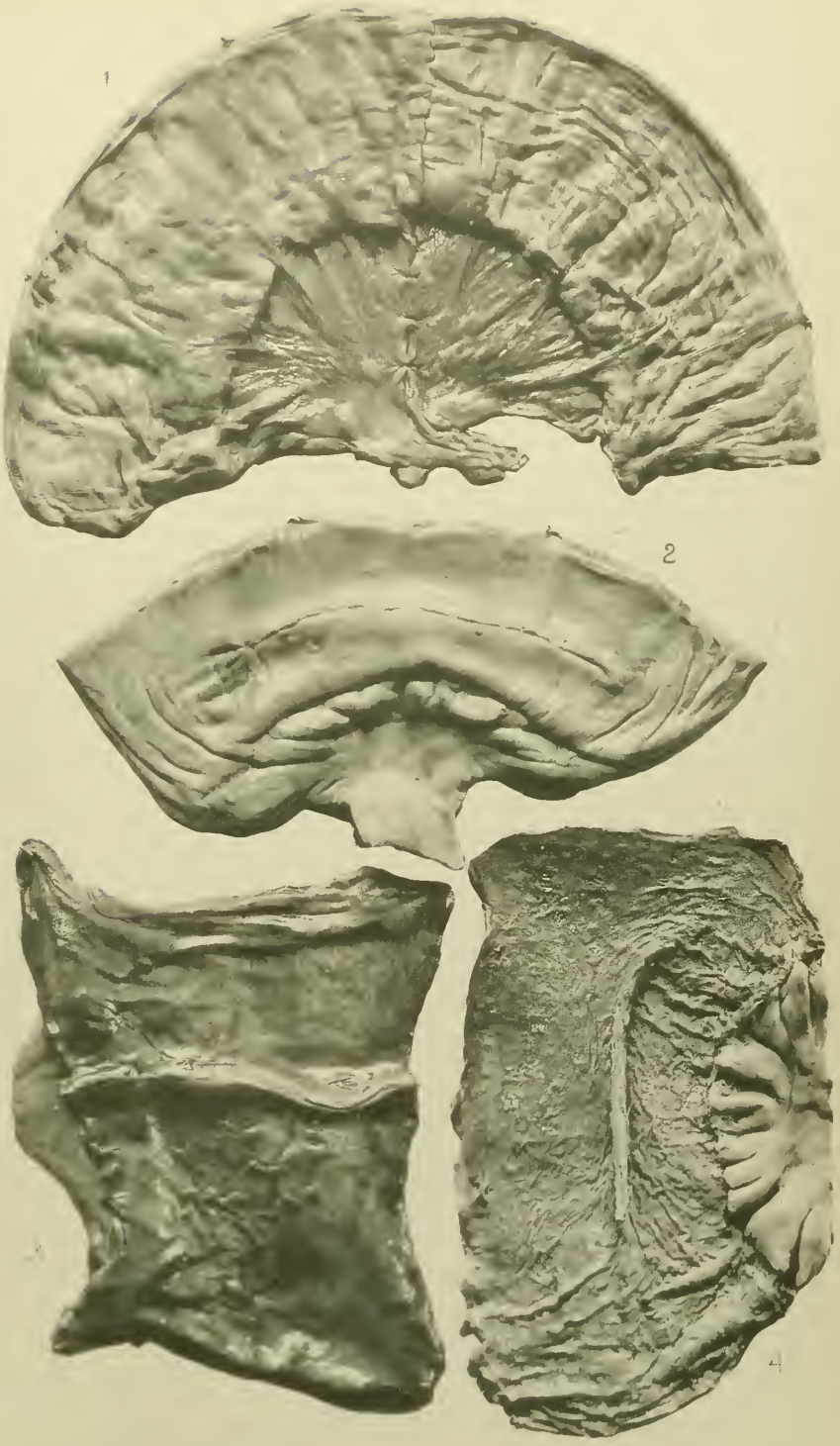
Human Ileum. Natural size. The specimens from which this plate was prepared were subjected to considerable manipulation before and while being photographed. This explains the exposure of the suture at two points in Fig. 2.

FIGURE 1. Resection wound closed with "Right Angle" suture. Wound of mesentery united with "inverted Lembert" (interrupted). The resection suture is terminated at a point one-fourth of an inch above the mesenteric border of the intestine.

FIG. 2. Longitudinal wound, closed by same suture.

FIG. 3 shows Fig. 1 from inside. Intestine has been cut open at about one-fourth its circumference from its mesenteric attachment, thus showing the manner in which the resected wound edges are inverted and apposed; also the accuracy of apposition at the site of the mesenteric insertion. The exposure of the suture at two points on the upper side of the wound is an apparent one only. The suture was not visible in the specimen from which the plate was taken.

FIG. 4 shows Fig. 2 from inside. Intestine is cut open along the mesenteric border and turned back, thus exposing the mucous surface. Shows the amount of inversion of the wound edges, and the manner in which the edges are apposed.



BOSTON PHOTOGRAVURE CO

PLATE I.

Fig. 1.

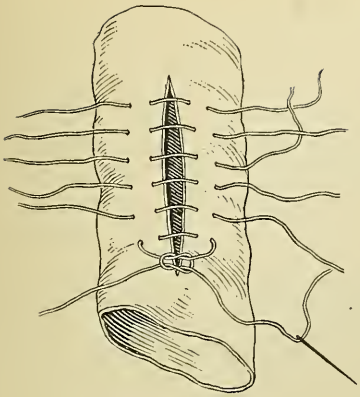


Fig. 2.

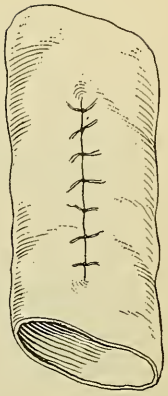


Fig. 3.

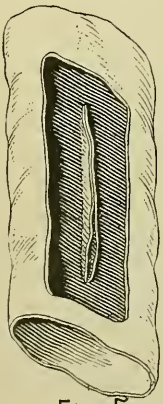


Fig. 4.

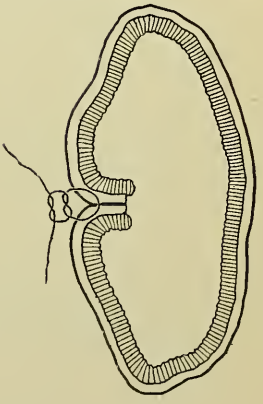


Fig. 5

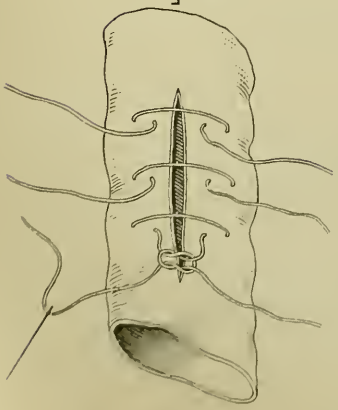


Fig. 6.

Fig. 7.

Fig. 8.

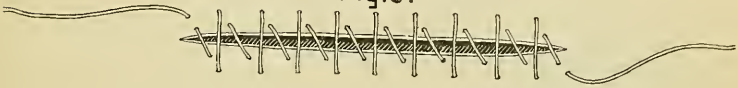


Fig. 9.

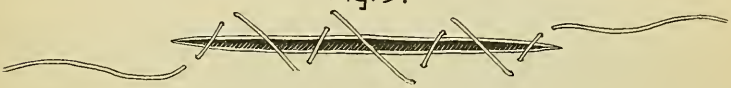


Fig. 10.

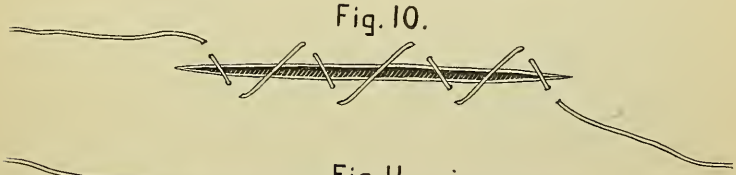


Fig. 11.

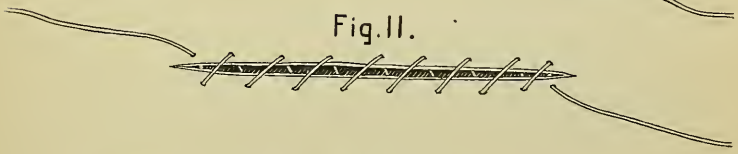


Fig. 12.

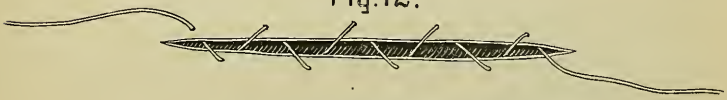


Fig. 13.

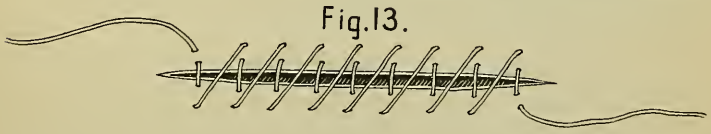


Fig. 14.

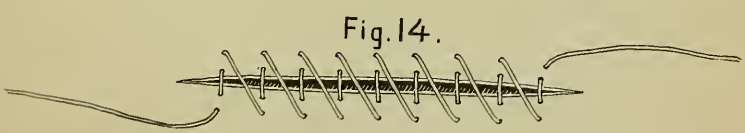
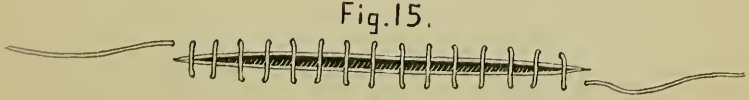
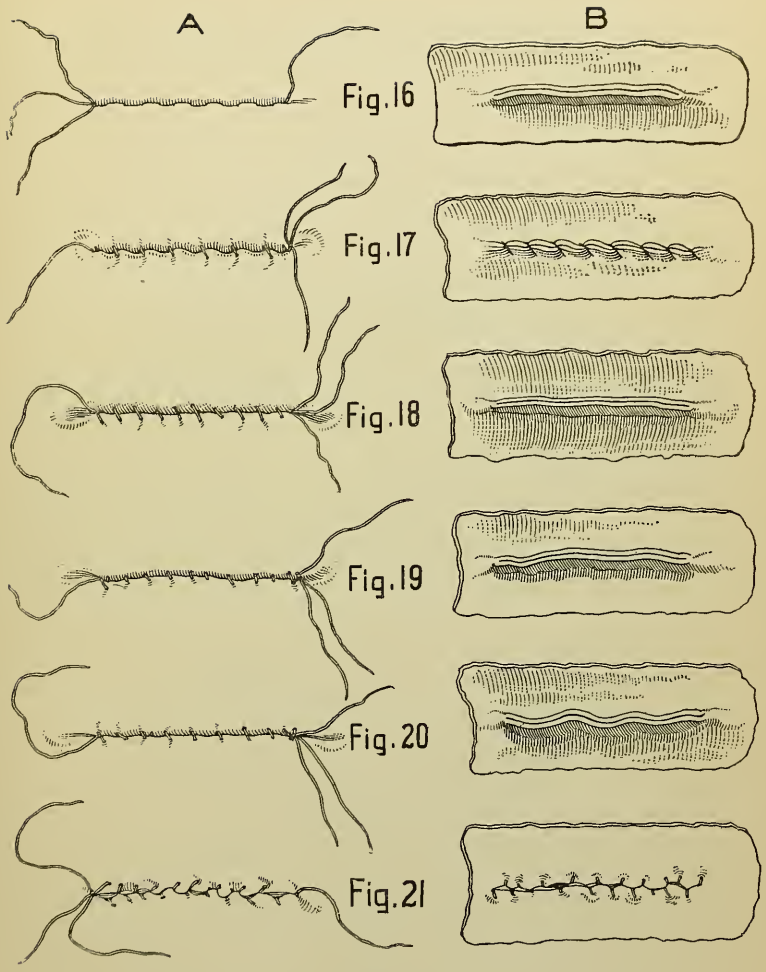


Fig. 15.



DESCRIPTION OF FIGS. 16 TO 21.

A. Serous surface. B. Mucous surface. Fig. 16. "Right Angle" suture. (Vide Fig. 15.) Shows the most accurate even wound closure. — Fig. 17. Kürschner. (Vide Fig. 11.) Mucous membrane included. The puckering and irregularity, especially of the mucous surface, more marked than in others except "glovers'." (Fig. 21.) — Fig. 18. Lembert. (Vide Fig. 14.) Shows a somewhat puckered wound. — Fig. 19. Variation of the Lembert. (Vide Fig. 7.) Mucous surface closely resembles Fig. 16. Serous surface, apposition not so even as by "Right Angle." It is not so easily inserted as "Right Angle." — Fig. 20. Variation of Lembert. (Vide Fig. 9.) Wound more irregular, except Figs. 17 and 21. — Fig. 21. "Glover's." (Vide Fig. 12.) Most unsatisfactory of all, not only in regard to irregularity of closure, but also since it inverts the peritoneal surface so that it is exposed on the inside, and everts the mucous membrane so that it protrudes on the outside of the intestine. A dangerous and faulty union, which readily leaks under tension.


A
B
Fig.16
Fig.17
Fig.18
Fig.19
Fig.20
Fig.21

DESCRIPTION OF FIGS. 22 AND 23.

Fig. 22. Diagrammatic. Actual size, as in human ileum. Peritoneal surface. *a–b*. Plan of suture at commencement of insertion.

Fig. 23. Ileum. Peritoneal surface. A. Suture in various stages of its formation. Note the direction of the needle inserted parallel to the wound instead of at a right angle to it, as in the Lembert and many other sutures. B. The completed suture. No knot or suture visible.

Fig. 22

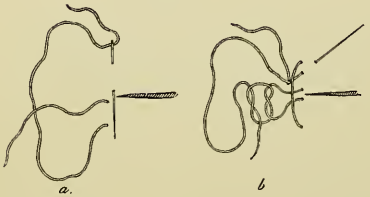


Fig. 23

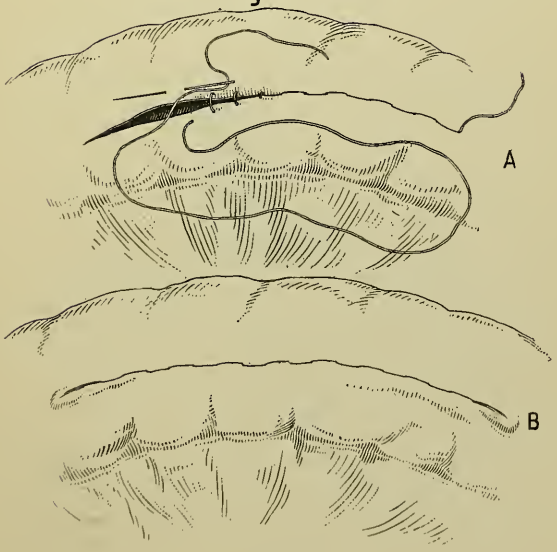


Fig. 24

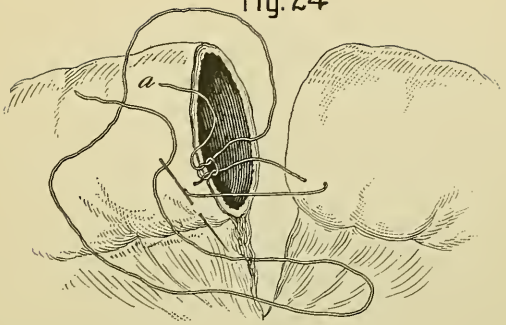


Fig. 25

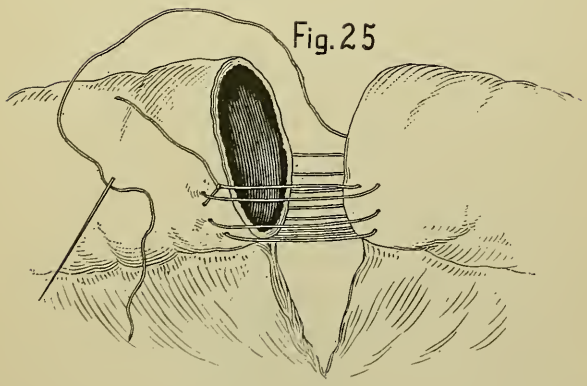


Fig.26.

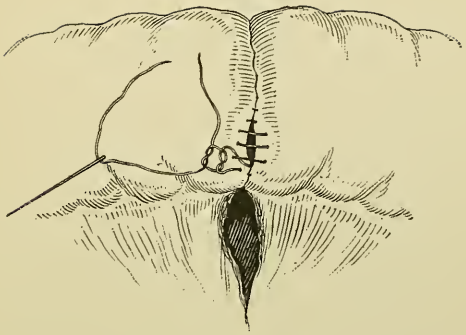
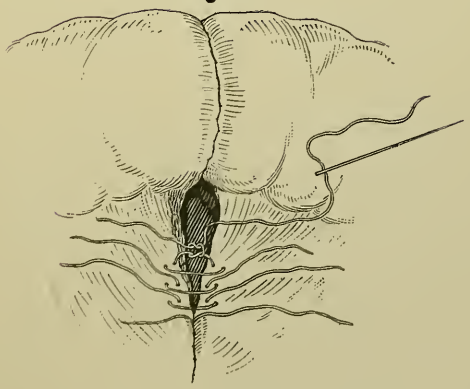


Fig.27



A CASE OF TUMOR OF THE BRAIN: REMOVAL; DEATH.

By Philip Coombs Knapp, M.D., and E. H. Bradford, M.D.

The great interest which at present attends all attempts at the operative treatment of cerebral tumors makes it incumbent upon the physician to report every case of the kind, whether successful or unsuccessful. This is our excuse for presenting the report of the removal of a cerebral tumor which was followed by death.

I. THE REPORT OF THE CASE (DR. KNAPP).

I was asked in November, 1888, by Dr. J. B. Brainerd, of Boston, to see Mr. G., who was said to be suffering from a cerebral tumor. I saw him on the 27th of November, and from the patient, his family, and Dr. Brainerd, who had attended him for some months, I obtained the following history: —

A. G., 32, married, a florist. The family history is negative; one or two children have died in infancy from the diseases of childhood, but there is no family or personal history of tuberculosis. Before the present illness he has been well. He admits gonorrhœa, but denies syphilis. At the age of twelve he had a fall, striking his head against a curbstone. He felt dazed, but walked home. The next day he felt ill, stayed at home, and in the afternoon he had seven convulsions. The day after he was well again and went to work. About May or June, 1886, he had nausea and vomiting, which lasted two or three months, and was attended with some pain in the head. He recovered from this perfectly, but about the beginning of 1887 both hands began to get stiff and feel weak. He thought he had poisoned

himself in some way by handling flowers, but there was no eruption on the hands. Some time after that he began to have more or less vertigo. With the stiff feeling in the hands there seems to have been a little loss of ability to use his left hand.

In March, 1887, he had a convulsion. He was alone in the room at the time, but the family heard a noise, and found him on the floor, unconscious, with a general convulsion of all the limbs, although it was noted that the left arm was chiefly extended and abducted. About the same time, probably after the convulsion, although he is not certain, he noticed that he could not use his fork as well, or hold objects as well with the left hand, and that the left leg was weaker. The numbness in the hand persisted, and he says that blisters appeared on the fingers.

In March, 1887, soon after he had the convulsion, he went to the Nervous Out-patient Department of the Massachusetts General Hospital. No notes were found in regard to the case, but at that time he had left hemiplegia, with exaggerated reflexes on the left, and slight contracture of the left arm. A diagnosis of cerebral tumor was made, and he was advised to submit to an operation for its removal, but, on learning the gravity of such an operation, he refused. He was given ten grains of bromide and five of iodide of potassium three times a day, and later, April 1, this was changed to sixty grains of iodide three times a day. I do not know how long he took it. Since then his sight has failed a good deal. There has been much numbness of the left hand, the paralysis of the left side has increased, and he has had repeated convulsions. Some of these were slight and others severe and general. In the latter he is unable to speak, his eyes stare, he bites his cheeks, and is unconscious sometimes for an hour. After such an attack he is stupid for the rest of the day. His convulsions begin, he says, by a "rumbling" in the left arm and a numb feeling in the left wrist, the hand is rapidly flexed and extended at the wrist, and then the arm is flexed and extended at the elbow, after which he loses consciousness. At a subsequent visit, his wife reported that in such convul-

sions as she had seen, his eyes rolled up and there were convulsive movements of the shoulder; subsequently the whole body was convulsed, or, at times, only the left arm. These convulsions are sometimes attended with severe pain in the head.

In March, 1888, he visited Dr. J. J. Putnam at his office, who took the following notes as to his condition, which were kindly furnished me: —

"March 9, 1888. Has been improving pretty steadily until about ten days ago. Has had three or four convulsions since leaving the hospital, at intervals of about three months. The last attack was about three weeks ago, and was very light, as is the rule in the later attacks. In the last he knew everything that was going on, though he could not speak to his wife, who was with him. The latter said that all that she noticed was a movement of the eyes. Within the past week or two he has had a new symptom, consisting in a very tired feeling, which runs up the back after he has been standing for a long time waiting on a customer. This feeling passes up the back and spreads over the head, and then objects seem to grow dark, and he feels dizzy and suffocated, and has to go into the fresh air. He never loses consciousness in these attacks, though he thinks he should if they were a little worse. This feeling lasts only a few seconds, and passes away when he sits down. He says that the sensibility in his left hand is as good as ever, but he can make no use of it. The leg is in about the same condition as a year ago, perhaps a little better." No information in regard to these attacks was volunteered, and, as I did not learn of them until after the patient's death, no inquiries in regard to them were made.

In June, 1888, the patient gave up work, and for much of the time since then he has kept his bed. At intervals since then he has had attacks of very severe pain in the back of the head, which required the exhibition of morphine. His memory for past events has grown poor, and he appeals to the members of his family to aid in giving his history. It is said that his speech is slower than formerly, but to a stranger there is nothing very peculiar about it, although it is noticeably deliberate. A month ago he had a very severe

attack of pain in the head, with a burning and "pulling" feeling in the tongue and stomach, and some difficulty in swallowing, the trouble finally yielding to morphine and bromide of potassium. For some time he has had "imaginings," — ideas that he was in various places, — lasting two to five days, the last one being two weeks ago. Ordinarily the mind is clear, and at present he has little headache, and no vertigo. His sight has steadily failed, but he has never had diplopia. He has never had earache, tinnitus, or deafness. His appetite and digestion are good. He is rather costive, but the nausea and vomiting have ceased. There are no thoracic symptoms, — cough, pain, dyspnœa, or palpitation, — and no trouble with micturition. He has a dead feeling in the left arm, and sometimes he cannot tell where it is; occasionally there is the same feeling in the left leg, and, to a slight degree, in the right arm. In walking, he has to drag the left foot after him.

Physical Examination. — The man is rather slender, reasonably well nourished, and intelligent looking. Peppermint is readily detected and named with either nostril. The vision is defective, but the field is fairly good. The pupils are of moderate size, and react to light and accommodation. He cannot move his eyes as far to the left or to the left and up, as he can to the right. The ophthalmoscope shows double optic neuritis. The tactile sensibility of the face is diminished on the left, and the masseters seem to contract less strongly. The right angle of the mouth is drawn up a little more than the left in laughing or talking; but he can draw the mouth to the left perfectly well voluntarily. The tongue is protruded straight without fibrillary tremor. He says his taste is unimpaired and that he can swallow well. There is diminished tactile sensibility over the left side, which is most marked in the left forearm. With the eyes shut, he is uncertain as to the position of either the left arm or the left leg. The left arm is held flexed at the elbow, with the wrist pronated and semiflexed, — the ordinary position in post-hemiplegic contracture, — and there is distinct rigidity of the arm and hand. The arm can be abducted and slightly rotated at the shoulder voluntarily, and flexed a little at the elbow, but

he cannot move the wrist or the fingers. He can move the right arm in all directions with fair strength. He can move the left leg in every direction, but it is rather stiff and noticeably weaker. The abdominal, epigastric, and cremaster reflexes are absent on the left and present on the right; the plantar reflex is present on both sides, but it is much more marked on the right. The triceps, radial, and ulnar reflexes are rather more marked on the left side than on the right. The knee-jerk is much exaggerated on the left, and there is a clonus both at the ankle and the patella on that side, with front tap contraction. Examination of the chest was negative. There was no tenderness on percussing the skull. He was able to stand and walk from the bed to the chair with some support, dragging the left leg; and he was not much fatigued by a rather long examination, lasting over an hour.

December 1. Examined again with Dr. J. J. Putnam. In his last convulsion, his wife says that the head and eyes were turned to the right. The eyes were again examined with the ophthalmoscope; and Dr. Putnam reported that there was such a swelling and projection of the discs as to require the addition of a $+\frac{1}{12}$ lens to overcome it. We found the sensibility to cold diminished in the left wrist, and that the tactile sensibility of the left side of the face was not so good as on the left side of the neck. He cannot tell, with his eyes shut, when the fingers of the left hand are moved.

At my first examination I made the diagnosis of a tumor of the brain, located in the right hemisphere and involving chiefly the centres for the wrist and hand in the ascending frontal and parietal convolutions, opposite the middle of the second frontal convolution. No definite conclusion was reached as to the nature of the tumor; but I believed it to be of good size, not very vascular, and possibly infiltrating, — perhaps an infiltrating glioma. I decided that an attempt at removal afforded the only chance for life, although I knew that, with advanced optic neuritis and secondary degeneration, perfect recovery was impossible. The chances of an operation were stated to the patient and his family, and

they decided to take the risk of it. He therefore entered Dr. Bradford's service at the City Hospital on December 17.

I saw him, with Dr. Prince, two or three hours after admission. He was then comfortable and in good spirits. He can apparently not localize a touch well on his left hand, referring a touch on the finger to the back of the hand. On the right hand he can localize fairly well. On testing his localizing power on the face, however, certain curious results were obtained. When either ear is touched, he refers the sensation to the right ear, saying so and indicating it by the finger. We then touched the ears and the nose, and asked where he felt it. If we said, "Is it the ear or the nose?" he generally answered, "The ear." On reversing our question and saying, "Is it the nose or the ear?" he would say, for three or four times, "The ear;" and then, seeming to comprehend the change in the question, he would say, "The nose," persisting in this reply in the same way when the question was changed again. Neither our questions nor his answers bore any relation to the facts as to whether the ear or the nose were touched. Beside answering in this way, he would indicate the point he thought was touched with his finger, in a way to correspond with his answers.

The remainder of the history is taken mainly from the hospital records, with a few additions and some abridgement: —

"December 18th. Seems comfortable and fairly intelligent. Rather slow mentally and physically. Slept fairly. Lies on right side most of time. Complains of cold.

"December 19th. Slept poorly. Got out of bed about 1 A.M. Said bed tipped over.

"The ears were examined by Dr. J. Orne Green, who reports: 'Ears both tightly filled with hard masses; cerumen removed after softening. Membrana tympani not particularly unnatural. Tests rather unsatisfactory on account of noisy ward. Watch D and S about twelve inches. Voice, low tones repeated accurately at about fifteen feet. Weber's test, fork C somewhat louder in the right. Rinne's test, fork C, R. $\frac{\text{air conduction}}{\text{bone conduction}} = \frac{40 \text{ seconds}}{14 \text{ seconds}}$. L. $\frac{\text{a. c.}}{\text{b. c.}} = \frac{35}{35}$. By

Valsalva method the air enters right with good note, left doubtfully. Not the slightest sign of any circumscribed congestion in external canal or drum membrane.'

"December 23d. Eyes examined by Dr. H. W. Williams, who reports: 'In both eyes outline of disc irregular. Vessels considerably diminished in size, especially the arteries. In the right disc a white streak stretches across half of disc, which might be from fibrous degeneration of nerve-tissue. There are no hemorrhages scattered about fundus, as are frequently found in brain tumors. In the left eye the appearance is that of beginning atrophy of the disc. In the right eye the same change, but not as far advanced.'"

Early in the forenoon of this day he was seen by Dr. Prince, who told me that his responses to the tests for localizing sensations were perfectly good. I saw him with Drs. Folsom and G. B. Shattuck later in the forenoon, and then his responses were much better than on the 17th, but they were not accurate. He was somewhat uncertain whether his ear or his nose was touched, but in the majority of cases his answer was correct. A day or two before he had a slight convulsion, seen by another patient, who stated that in it his eyes rolled up, his fingers worked, and later the whole arm shook. During my visit I questioned him in regard to his family history, and, among other matters, he began to tell me of a brother who died in infancy of cholera infantum — some years ago. Suddenly he stopped in the midst of a sentence, his mouth was drawn a trifle to the left, and both corners were drawn up, and the face assumed an expression as if he were just about to burst into tears. Almost simultaneously the left arm, which was lying across his body, was raised an inch or two, carried a trifle toward the median line, the hand was a trifle more pronated, and the whole arm trembled slightly. In about fifteen seconds this ceased, and he resumed his sentence. When asked what the matter was he said, "Nothing." When asked what he did, he said he did nothing. At last, when asked why he broke off his sentence thus, he said that it made him feel badly to talk about his brother.

"December 24th. Convulsion seen by head nurse, who reports: 'Attention attracted by a loud moan; patient lying on left side (ordinarily lay on right),* head slowly and rigidly drawn backwards. I took hold of his left wrist, the hand and tendons were rigid and twitching; the arm was also twitching, especially at the shoulder-joint. Convulsion lasted three or four minutes. Pupils widely dilated. He was able to speak during the convulsion, and kept up a continual moan. Head very hot after it, and he was thirsty. Did not appear more stupid after it.'

"December 25th. Two or three slight convulsions during the past few days; otherwise comfortable. The convulsion is said to begin by twitching at the metacarpo-phalangeal joint of the left hand, then becoming more general. Last night was very noisy, cried out, and complained somewhat of pain in the head. When asked what the reason was for his cries, he answered that he was all right. This afternoon he had a convulsion, falling out of bed and cutting his forehead slightly over the left eye.

"December 26th. Another bad night Very noisy. Required three doses of bromide of potassium, forty grains each, during the night. Seems more comfortable, but more stupid. Head shaved.

"Eyes examined by Dr. Wadsworth, who reports: 'Very marked papillitis in both eyes. Discs swollen, prominent, with steep sides, the swelling entirely hiding the outline of the disc, but not extending much beyond it. The retina, up to the immediate neighborhood of the discs, quite transparent. The swollen disc is grayish, containing very numerous fine vessels. The central veins on the disc are a little large, the arteries almost invisible. This last condition is especially marked in the right eye. On the retina the arteries and veins are of almost normal size and condition. A few quite small hemorrhages close to the disc. Central portion of disc in right eye shows more whitish reflex (sclerosed nerve fibre or connective tissue?). The inflammation appears in rather a more active stage in this eye than in

* The patient told the nurse that his wife had noticed that every time he lay on his left side he would have a convulsion.

the other. The sight is evidently imperfect, the exact amount of it not easily determined. The movements of the eyes in all directions not carried out as far as normal, but this seems to be due to the mental condition, as there is no evident paralysis.'"

The same afternoon I examined the surface temperature of the head, using two thermometers lent me by Dr. Putnam. They were held on the scalp so firmly as to leave an indentation, applied to corresponding points, and held in position for five minutes.

One and a half inches above external angle of orbit. R. 94.6. L. 94.8.

Over supposed site of tumor (see cross in Fig. 1). R. 95.4. L. 94.9.

On this trial the pressure with the left-hand thermometer was a little less constant.

Over parietal eminence. R. 95.5. L. 95.6.

These tests seemed to tire him, and he complained a good deal of them, and of headache, so I did not proceed farther.

"December 27th. Throat and nose examined by Dr. De Blois, with negative results.

"Urine slightly high colored, acid 1016. No albumen or sugar. Sediment slight and flocculent, few round cells, mucus, few crystals of uric acid and calcic oxalate.

"Patient was fairly quiet during the night, but he had to have bromide and morphine ($\frac{1}{6}$ grain) for severe headache. Slept heavily most of the morning. Dr. Knapp marked out the fissures on the scalp with an aniline pencil [using the methods of Broca, Reid, and Horsley], marking the chief fissures, later, with a solution of nitrate of silver. [Too strong a solution was used, and the result was a destruction of the epidermis, leaving a raw surface. Tincture of iodine would be better.] The patient sat up in a steamer-chair during the process, but toward the end grew weak and became restless and uneasy, vomiting violently. Complained of pain in the head after getting back in bed, and had cold applications to the head and morphine. His moods changed rapidly, at times he joked with his friends, at others complained of his head. Pain referred to right parietal region. Since

entrance, there has been a marked change for the worse in his condition. He takes nourishment but poorly. [He bore the long examination in November very well, but his exhaustion after the simpler process of measuring his skull was so great that I really grew alarmed as to his condition.] Given two drachms of fluid extract of ergot three times to-day.

"December 28th. Somewhat noisy; headache towards morning, requiring bromide and morphine. In the forenoon said he felt very well, and was anxious to have the operation over."

II. THE REPORT OF THE OPERATION (DR. BRADFORD).

The operation of removal of tumor of the brain was undertaken in this case after due deliberation, with the hope that the patient's condition might be improved by such operation. The patient himself was fully informed of his condition, and his relatives were told of the risk of the undertaking. The operation was performed December 28. The day before the operation the patient's head was scrubbed, cleaned, and shaved, washed with soap and water, and the lines of localization were marked by a solution of nitrate of silver by Dr. Knapp, the head washed with corrosive sublimate, and a dressing of corrosive sublimate applied to the scalp. Fluid extract of ergot a day previous to the operation, and a subcutaneous injection of morphia was given just previous to etherization. A large semicircular incision was made, with the concavity downwards and backwards, with the supposed site of the tumor as a centre. The flap was reflected back, and a trephine applied from the side of the tumor.

Some delay was caused by bleeding from the scalp, which was eventually stopped by the use of a rubber band. The skull was perforated by a $1\frac{1}{4}$ inch trephine applied in two adjacent points, the trephine being an inch in diameter, and half an inch was removed by means of a saw and bone forceps. (Fig. 1.) A semicircular flap of the dura was divided one-eighth of an inch from the margin of the bone. The brain was found to bulge and pulsate, but was normal in color. A fissure,

running downward and forward in the supposed line of the fissure of Rolando, was noted in the posterior part of the opening. The brain convolutions were flattened, and the brain gave on palpation a somewhat fluctuating feeling. The cortex of the brain was incised with a knife and a probe inserted. No resistance was encountered. The incision in the cortex was enlarged, and the forefinger inserted and carefully pushed downward, and at a distance of half an inch

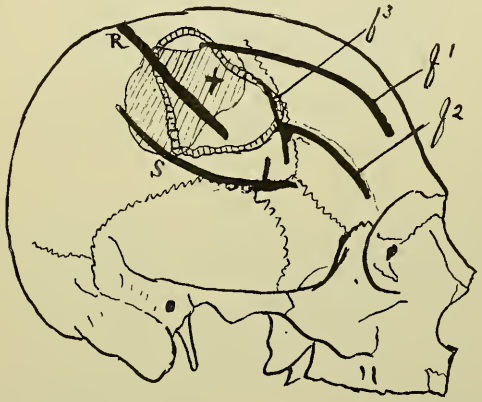


FIG. 1. Diagram of right half of skull; ⅓ natural size. The heavy black lines denote the fissures, the shaded portion the tumor, the double line the outline of the opening made in the skull, the cross the point marked as the chief seat of the tumor.

R = fissure of Rolando; S = fissure of Sylvius; f^1, f^2 = first and second frontal sulci; f^3 = precentral sulcus.

from the surface of the cortex a difference of resistance was detected, and this was found to extend downwards and backwards toward the cerebellum till the full length of the finger was inserted. The resistant portion was felt to be distinctly different from the surrounding tissue of the brain.

On withdrawing the finger back from where it had been inserted a small nodule was found directly under the cortex connected with a deeper nodule, but easily detached from it by careful manipulation; the finger was passed around the whole mass, and separating it from the adjacent parts the tumor was then turned out of its bed by means of the finger, stretching the incision in the cortex slightly. There was no

hemorrhage from the brain. The brain-substance around the tumor appeared to be of normal consistency and appearance.

The removal of the tumor from the brain had no immediate effect upon the pulse or respiration, and after the removal the pulse, which was very weak, improved slightly. The fragments of the bone, which had been removed by trephine and bone forceps, were placed in sterilized water kept at blood-heat by means of a water-bath. These were inserted after the tumor was removed, the cavity in the brain having been irrigated by warm sterilized water; a drainage-tube was inserted, the skin-flap closed. The flap of the dura mater was not stitched, as it was found that this could only be done by stretching the dura mater more than was thought advisable.

The patient's pulse, at the beginning of the operation, was 58, of fair strength and regularity.

After the removal of the trephine button, the pulse was 96 and intermittent. The respiration was 20, and regular. The pulse began to fall rapidly, and at the time the trephining was complete, the pulse could not be felt at the wrist.

The respiration increased to 24; several subcutaneous injections of brandy and atropine were given, but no effect upon the pulse could be noted. The pulse, at the time of the removal of the tumor, was 156, and very weak. The respiration remained quite regular until after the operation was finished, when it increased to 36, and became very shallow and weak. Three-quarters of an hour after the operation the patient died. The whole operation from the time of the first incision to the removal of the tumor was fifty minutes. Ten minutes more were required for the completion of the dressing. No autopsy was allowed. It may be added that the tumor was found to be in precisely the location indicated by Dr. Knapp, and that the size and location of the tumor proved to be exactly what was predicted before the operation.

After removal the tumor was found to weigh $35\frac{3}{4}$ grammes, and measured 7 by 4 and 3 centimeters. (Figs. 2, 3, 4.) On section, extensive white cheesy centres were found surrounded by a thin, irregular layer of firm, yellowish-brown,

slightly translucent tissue. The central cheesy portion of the layer nodule presented a suggestion of a concentric arrange-

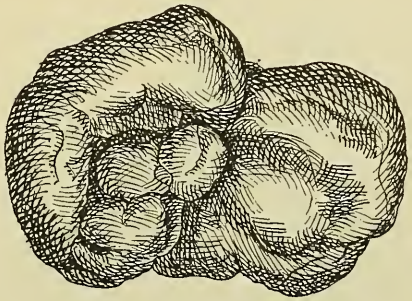


FIG. 2. The tumor, natural size. Drawn by Dr. H. P. Quincy.

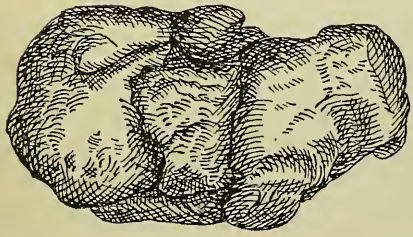


FIG. 3. The tumor, natural size. Side view. Drawn by Dr. H. P. Quincy.

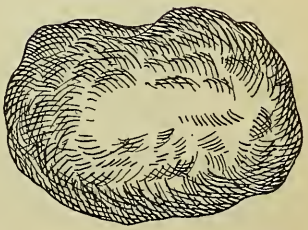


FIG. 4. The tumor, natural size. End view. Drawn by Dr. H. P. Quincy.

ment of layers. Under the microscope, fibrous tissue, with many giant cells, epithelioid cells, and an extensive round-celled infiltration.

Dr. Henry F. Sears, assistant pathologist to the hospital, reports as follows : —

"Microscopically the growth was seen to consist of finely granular detritus, surrounded by a layer of connective tissue, in which were seen many giant cells with epithelioid cells, and round cell infiltration.

"On staining sections, from a portion of the growth hardened in alcohol, by Koch's method, the presence of the bacilli of tuberculosis was seen, thus confirming the diagnosis of tuberculosis." (Fig. 5.)

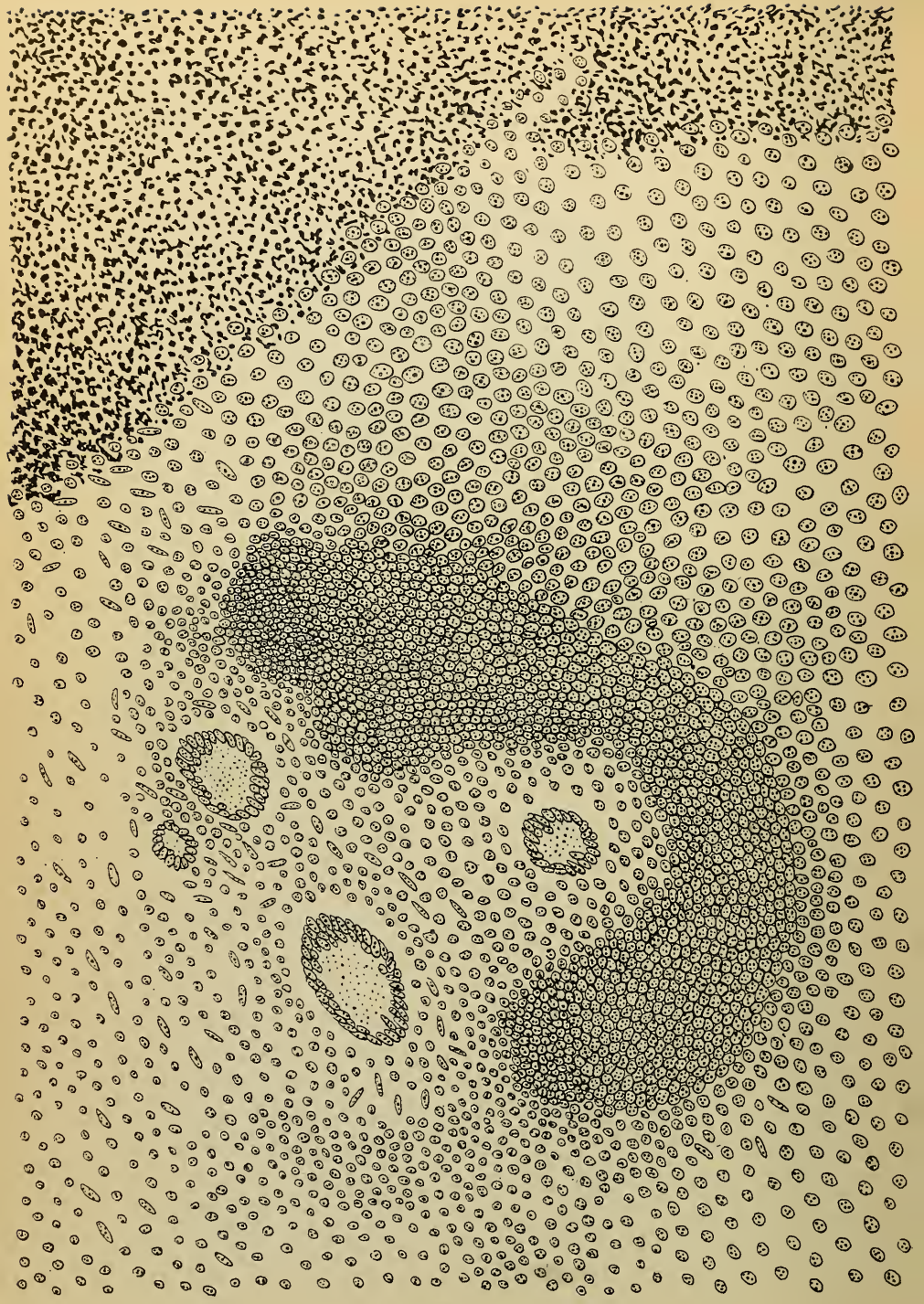


FIG. 5. Microscopic section of the tumor.

III. GENERAL MEDICAL CONSIDERATIONS UPON DIAGNOSIS AND THE ADVISABILITY OF OPERATION, WITH REMARKS ON CRANIO-CEREBRAL TOPOGRAPHY. (DR. KNAPP.)

1. The Diagnosis. — I will not attempt to discuss the subject of cerebral localization as applied to intra-cerebral

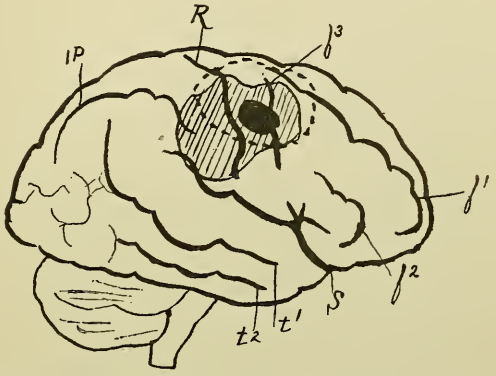


Fig. 6. Diagram of right half of brain, ½ natural size. Reduced from Dalton, Series A, Plate II. The shaded portion represents the estimated seat of the tumor, the inner black circle the spot marked before the operation as the chief seat of the tumor, the outer dotted circle the estimated extent of the tumor before the operation. The position as given was obtained by placing the tumor on the diagram in the position which seemed most nearly to correspond to its situation in the brain, supposing the black spot to be beneath the cross in Fig. 1. It lay obliquely in the brain.

IP = inter-parietal sulcus; t^1, t^2 = first and second temporal sulci; other letters as before.

Fig. 7. Horizontal section of right hemisphere, through the centre of the black spot, ½ natural size. Reduced from Dalton, Series B, Plate II.

Fig. 8. Vertical section of right hemisphere, through the centre of the black spot, ½ natural size. Reduced from Dalton, Series C, Plate VII. The tumor probably crowded the basal ganglia over toward the median line, and did not involve them.

V = ventricles; CN = caudate nucleus; IC = internal capsule; LN = lenticular nucleus; O = optic tract.

growths. That has been done so many times of late as to render another essay on the subject needless, so that I will speak here merely of the reasons which led me to believe that we had to do with a sub-cortical tumor of considerable size situated in the middle and upper portions of the right ascending frontal and parietal convolutions. (Figs. 6, 7, 8.)

1. *The Diagnosis of the Tumor.* — In many cases, of course, the diagnosis of a cerebral tumor is difficult, and it may be impossible. In this case, however, it was easy. The four classical symptoms of tumor — headache, vertigo, vomiting, and optic neuritis — were all present, while the gradual mental failure and the increasing weakness, with the neuritis, showed increasing intracranial pressure, and strengthened the diagnosis. Additional evidence in favor of the existence of a tumor was afforded by the focal symptoms.

2. *The Diagnosis of the Location of the Tumor.* — The symptoms given above showed that we had to do with a tumor; the symptoms which helped to determine its situation were the convulsions, paralysis with contracture, anæsthesia, and loss of muscular sense. The history was too uncertain to determine what was the signal symptom, and I could not learn definitely whether the convulsion or the paralysis came first.

The convulsions, for the most part, were preceded by a sensory aura in the left wrist and forearm, and began with spasm of the wrist. They were often limited to the arm. Convulsions of this sort have great value in localization. They show with great probability that the lesion involves the motor cortex, or the parts immediately below it. They are of much less value, however, in determining what part of the motor cortex is involved, for the irritation may start from any part of the lesion, so that with a large lesion, the exact seat is uncertain; in fact in this case they seem to have affected different parts of the arm at different times. The convulsions in this case, however, indicated that the chief seat of irritation was in the centre of the wrist and fingers.

Paralysis has a much more exact value in localizing. It was most marked in the hand and forearm, and was attended with contracture and exaggerated tendon reflexes, showing

that the lesion had given rise to secondary degeneration, and therefore extended probably below the cortex. Bramwell, says that epileptiform convulsions of the Jacksonian type are more certainly produced by a discharging lesion in the motor area of the cortex, than localized paralysis by a destroying lesion; but that, when localized paralysis due to a cortical lesion is present, it is more certainly indicative of the exact seat of the lesion than a localized convulsive seizure. The paralysis, therefore, showed that the cortical tumor affected chiefly the centres for the wrist and fingers, but probably involved all the centres for the arm, and, to a certain extent, those for the leg. In other words, the growth probably extended from the junction of the lower and middle thirds of the ascending frontal convolution, opposite the second frontal sulcus, to a level about even with the middle of the first frontal convolution, and it extended from just in front of the prefrontal sulcus back across the ascending parietal convolution. The result showed, however, that the leg centres were not so much involved as I had supposed.

The significance of anæsthesia as a focal symptom has been much discussed, and the location of the cortical sensory centres is still a matter of dispute. Ferrier[2] places the centres for sensation in the hippocampal region, and opposes the belief that the Rolandic region has anything to do with sensation. The majority of authorities, however, — Munk, Luciani and Seppilli, Horsley, and Starr, — think that in the Rolandic region, distributed in the same way as the motor centres, are sensory centres, and Horsley[3] has pointed out what cells may be sensory and what motor. Dana,[4] at the last meeting of the American Neurological Association, showed pretty clearly that, as far as man is concerned, Ferrier's idea of sensory centres in the limbic lobe is without support, and that the centres for sensation are in the Rolandic region. Without an autopsy we cannot be sure that the limbic lobe in this case was healthy, and, furthermore, it may be urged that the tumor extended deep enough to affect the sensory tract in the posterior third of the posterior limb of the internal capsule, — Charcot's sensory cross-way. The anæsthesia, however, varied in

intensity in the same way that the paralysis did, being most marked in the wrist and forearm; so that I believed that it was due to a lesion of the cortex in the supposed sensory centres in the Rolandic region, and the existence of a sensory aura, with an irritative lesion of the hand centres, seemed to support this view.

Munk [5] has shown that the muscular sense is compounded of four ideas, — ideas of touch, of pressure, of the position of the limbs, and of the feeling of innervation of the muscles. These are all, he thinks, associated with the cortical motor centres. Horsley speaks of the sense of present movement (the feeling of innervation?) and the memory of past movements (ideas of position?), and he places these also in the motor centres. Both of Horsley's forms were affected in this case. There is some evidence, however, in favor of the belief that the inferior parietal lobule in man is a centre for the muscular sense, possibly, as Dana thinks, a centre for the memory of past movements. Neglect of this theory led me, perhaps, to the error which I made in defining the lower and posterior limit of the tumor.

Having thus determined the position of the tumor, the question arises whether it were cortical or subcortical. This question cannot be determined with certainty; but Seguin [6] gives certain indications for diagnosis. "In favor of a strictly cortical or epicortical lesion," he says, "are localized clonic spasm; epileptic attacks beginning by local spasm, followed by paralysis; early appearance of local cranial pain and tenderness; increased local cranial temperature. In favor of subcortical location of tumor: local or hemiparesis followed by spasm; predominance of tonic spasm; absence, small degree, or very late appearance of local headache and of tenderness to percussion; normal cranial temperature." From the absence of severe headache, local headache, and tenderness, from the presence of tonic spasm, and from the negative though unsatisfactory results of cranial thermometry, I believed that the growth was subcortical.

In every case of tumor where an operation is thought of, we must decide whether the growth is single or multiple. Here there were no symptoms which could not be explained

by a single lesion. In every case, however, we have to run the risk of other lesions, so situated as to give rise to no symptoms. In the present case the nodule first removed was almost a distinct growth; and Seppilli[7] holds that large tubercles are formed by the fusion of several smaller growths.

3. *The Diagnosis of the Nature of the Tumor.* — This is usually uncertain. The age, the absence of cachexia, and of signs of a neoplasm elsewhere, excluded carcinoma. The absence of any personal or family history of tuberculosis, and the apparent good condition, led me to think tubercle not very probable. The slow and steady increase in the symptoms and the absence of apoplectic seizures or signs of sudden variation in intracranial pressure excluded the more vascular forms of glioma; but I was disposed to think that there might be either a less vascular form of glioma or a sarcoma; and, with these, there was the danger of infiltration. The absence of any syphilitic history, and the general aspect of the case, the slow progress, and the absence of transitory and multiform symptoms, made me believe that the growth was not syphilitic; and therefore, although I could not tell whether a thorough trial of iodide had been made, I decided not to prescribe it, thinking it probably useless and fearing some debilitating effect. The result justified my decision.

2. The Advisability of Operating in Cases of Cerebral Tumor.

1. *The History of the Operation, with a Summary of Reported Cases.*

The attempts to remove intra-cranial growths fall naturally into two groups. The first group is formed by the cases where the new growth has been dural or extra-dural, and has been the extension of a growth outside the cranium. In these cases the external growth has proved the guide for trephining, and the surgeon, induced to operate by symptoms of intra-cranial pressure, has trephined over the extra-

cranial growth, and has found the intra-cranial growth beneath. The second group is made up of the cases where there were no external manifestations of a new growth on the outer surface of the skull,—the new growth being diagnosticated and located by the physician in accordance with the principles of cerebral localization. In these cases the principles of localization were the only clue, and the surgeon has trephined over the theoretical site of the tumor, finding it beneath his opening.

Cases of the first group I have been at no pains to collect. Such operations were done, naturally, before any attempt was made to operate on cases of the second class, and cases have been reported by Macewen,[8] Bergmann,[9] Barton,[10] and others. Some operations have been followed by recovery, others by death. Although such cases are of value in any study of brain surgery, they naturally do not interest the neurologist in the same way that cases of the second class do.

The first attempt to remove a cerebral tumor, when the growth showed no outward signs of its existence, was made on the 25th of November, 1884, by Godlee on a patient of Hughes Bennett's.* Since that time there have been fifteen cases in which a tumor has been removed, one where the tumor was found, but not removed, four (one of them as yet unpublished) where it was not found, and four where cysts were removed or evacuated,—twenty-four cases in all, which I shall summarize as briefly as possible.†

TUMORS OF THE FRONTAL LOBE.

Durante. ("Lancet," Oct. 1, 1887.) Woman, 40. Left eye seemed lower than right. No smell. Poor memory. Sense of vacuity, with uncertain movements. Sad

* Durante's case was the earliest cited, but external manifestations were apparently the guide, so that I was almost inclined to reject it, as I did the cases of Bergmann, Macewen, and Barton. Park[11] puts Macewen's case earliest of all, in 1883, but Macewen himself puts it after Bennett and Godlee's. Where the dates of operation were known, I have arranged the cases chronologically.

† This list is believed to be complete, being based on an investigation made at the Library of the Surgeon-General's office at Washington.

and melancholic. Trephined, May, 1884, over left frontal bone, above orbit. A lobular, fibro-cellular sarcoma, weighing over two ounces (70 grammes), removed from anterior fossa. Complete recovery.

TUMORS OF THE ROLANDIC REGION.

1. *Bennett and Godlee.* ("Med. Chir. Trans.," lxviii, 243, 1885.) Man, 28. Three years before slight twitching of left side of face. Convulsions, with sensory aura in face, spasm beginning in face, extending to arm and leg. Paralysis left arm. Intolerable headache. Double optic neuritis. Reflexes increased; sensation normal. Hard glioma size of walnut removed from middle and upper thirds of ascending convolutions, Nov. 25, 1884. Improved, but died in a month from meningitis (septic).

2. *Hirschfelder and Morse.* ("Pacific Med. and Surg. Journ.," April, 1886.) Man, 33. Dull headache for two years with vertigo. Left leg stiff and arm weaker. Convulsions. Twitching of left face; spasm of arm and face. Hemiparesis, contracture leg. Knee-jerks increased, especially on left. Slight anæsthesia of face. Optic neuritis. Two and a half cubic centimeters of a soft, infiltrating glioma removed from right ascending parietal convolution, 15th February, 1886. Death eight days later from encephalitis (septic).

3. *Horsley.* ("British Medical Journal," April 23, 1887. Case 2 of table.) Man, 20. Irritative lesion in thumb area; epileptic seizures at least once a week; spasms of thumb type constantly. Mind fairly active. Incomplete paralysis of arm. Tubercular tumor removed from thumb centre, June 21, 1886. Recovery, with fewer fits.

4. *Horsley.* (Art. cit., Case 4 of table.) Man, 38. Irritative and destructive lesion in brain. Complete left hemiplegia. Coma for ten days. Epileptiform seizures, beginning in left shoulder. Four and a half ounces of infiltrating glioma removed Sept. 23, 1886. Recovery. Much improved in paralysis. Mind clear. No fits. Symptoms recurred three months later. Death six months after operation.

5. *Horsley.* (Art. cit., Case 9 of table.) Man, 37. Irritative and destructive lesion. Right hemiplegia. Epileptic seizures, beginning in right forefinger. Constant headache. Complete paralysis of arm, incomplete of leg. Slight defect in speech. Tumor removed, Dec. 7, 1886, weighing four and a quarter ounces. Recovery. Paralysis unchanged. No headaches or fits.

6. *Seguin and Weir.* ("American Journal of the Medical Sciences," July–September, 1888.) Man, 39. Headache, spasm of right cheek for six years. Three years ago convulsion; twitching of right arm, hand, and face. Face and arm weaker. Slight tactile anæsthesia hand. Muscular sense, cranial temperature, and fundus oculi normal. Knee-jerk greater on right. Sarcoma, size of end of finger, removed from deep down below precentral sulcus, Nov. 17, 1887. Recovery. Paresis and anæsthesia of face and arm persist. Slight aphasia and agraphia.

7. *Macewen.* ("Lancet," Aug. 11, 1888. Case 9.) Girl, 7. Pain and spasm in right great toe, leading to convulsions. Paresis right leg. Sensation unimpaired. Tubercular tumor, size of hazel-nut, removed from left ascending parietal at top. Few small nodules in meninges. Recovery. No fits.

8. *Keen.* ("American Journal of the Medical Sciences," October, November, 1888.) Man, 26. Injury to head at age of three. Scar on head. Intense headache and epileptic seizures for three years. Paralysis of right arm, leg, and face. Pain on pressure. Right eye, pupil dilated, vision poor. Aphasia. Loss of vision. Gastric aura. Paresis right internus, left inferior and superior recti. Left homonymous hemianopsia. Post-neuritic optic atrophy. Dura adherent to skull. Fibroma, weighing over three ounces, removed, Dec. 15, 1887, from ascending frontal, chiefly in lower two-thirds, extending into frontal convolutions and ascending parietal. Recovery.

9. *Ballet, Gelineau, and Pean.* ("Gazette des hôpitaux," Feb. 21, 1889.) Man 28. Epiliptic attacks for six years, about once a week. Before operation status epilepticus, with temperature of 40° C. Painful spasm of right great toe,

with rigidity of leg, and tonic and clonic convulsions, afterwards affecting arm and face. Paresis of right leg between attacks. Trephined over upper part of ascending convolutions, left. Fibro-lipoma of pia removed, Dec. 7, 1888. Recovery. No fits to date.

10. *Knapp and Bradford.* Case reported above. Dec. 28, 1888.

TUMOR OF THE OCCIPITAL LOBE.

Birdsall and Weir. ("Medical News," April 16, 1887.) Man, 42. Unsteady gait. Vomiting. Diplopia. Numbness of right half of body. Headache. Walks towards right. Left lateral hemianopsia. Fundus normal; later neuritis. Some awkwardness of left side. Sarcoma, weighing five and a quarter ounces, enucleated from right occipital lobe, March 9, 1887. Death in eleven hours from hemorrhage.

TUMORS OF THE CEREBELLUM.

1. *May.* ("Lancet," April 16, 1887.) Boy, 7. Frontal headache with vomiting. Failure of vision, optic neuritis; eyes turned to left. Staggering gait, backwards and to the left. Nystagmus. No knee-jerk. Emaciated and feeble. Tubercular growth, size of pigeon's egg, an inch below surface of cerebellum removed July 19, 1886. Death in a few hours from shock.

2. *Horsley.* (Art. cit., Case 10 of table.) Man, 18. Headache, vomiting, optic neuritis, weakness of all the limbs. Head and eyes turned to right. Tubercular tumor, weighing seven drachms, removed from right lobe of cerebellum Dec. 17, 1886. Death in nineteen hours. Chronic tuberculosis of viscera.

3. *Suckling.* ("Lancet," Oct. 1, 1887.) Girl, 12. Headache, vomiting; dim vision; right hemiparesis; tremor of right arm; vertigo; staggering gait, with tendency to fall forwards; optic neuritis; nystagmus; left facial paresis with reaction of degeneration; diminished knee-jerks. Part of a soft gliomatous mass (which was infiltrated, involving the

whole left lobe and part of the middle lobe) removed from the cerebellum March, 1887. Death in a few hours from shock.

To these fifteen cases, in which the tumor was found and removed, we must add four other cases in which either the tumor could not be removed, or was not found at the place trephined.

TUMOR WHICH COULD NOT BE REMOVED.

Ross and Heath. ("Lancet," April 7, 1888.) Man, 20. Headache; convulsions; left hemiparesis; optic atrophy; left side of face and left arm convulsed; tender spot over base of right ascending frontal. Trephined Oct. 13, 1887, over tender spot, and large lobulated tumor found, adherent to anterior fossa. Not removed. Recovery from operation. Symptoms unchanged, except some relief from removal of pressure.

TUMORS NOT FOUND AT PART TREPHINED.

1. *Amidon and Weir.* ("Annals of Surgery," June, 1887.) Woman, 26. Sarcoma removed from neck; brachial plexus injured, causing paralysis of left arm; cramps in left leg, leg weaker; clonic spasm of leg; left hand numb, with cramps; frontal headache; right arm weaker; knee-jerk exaggerated left; left optic neuritis. Trephined Oct. 11, 1886, over upper part of fissure of Rolando. Piece of cortex, size of an egg, removed, which was much congested, but otherwise healthy. Headache and spasm ceased; paralysis improved; three weeks later right side became paretic. Death ten weeks after operation. Sarcoma in cerebellum, extending down cord.

2. *Dana and Pilcher.* ("Medical Record," Feb. 9, 1889, and personal communication from Dr. Dana.) Man. Injury to skull. Two years later epileptic attacks and mental impairment. No localizing symptoms. Trephined over seat of injury, over angular gyrus. Brain projected, and a piece was removed. No tumor found. Death in thirty-eight hours, from respiratory failure. Glioma in anterior half of

left hemisphere, extending into corpus callosum, which could not have been removed.

3. *Wood and Agnew.* ("University Medical Magazine," April, 1889.) Man. In 1886, vertigo and loss of consciousness; loss of power of mental concentration. In 1888, double optic neuritis, with limited field. January, 1889, left lateral hemianopsia; loss of power of balancing; severe headache; trephined over right cuneus. Feb. 11, 1889, cyst from hemorrhagic softening found in cuneus. Died of shock and hemorrhage in a few hours. Large tumor found in right temporo-sphenoidal lobe.

4. *Putnam and Beach.* Case not yet reported, resulting fatally. Trephined over third frontal. Tumor in inferior parietal lobule.

Finally, there are certain cases of intra-cerebral cysts, with symptoms more or less closely allied to tumor, where the skull has been trephined and the cyst evacuated or removed. I take no note of dural cysts — traumatic cysts following depressed fractures of the skull, or hemorrhagic cysts from meningeal hemorrhage; and, moreover, I exclude cases where the skull was trephined to evacuate a supposed abscess, and, at the autopsy, a tumor was found, as in Sands'[12] and Sciammana's cases.[13]

CEREBRAL CYSTS.

1. *Markoe.* ("Medical News," Nov. 5, 1887.) Man, 25. Fall, striking head, followed by convulsion; recovery. Eight years later similar fall; convulsions recurred; depression left parietal; dull pain; convulsions, with opisthotones. Trephined Jan. 27, 1887; over depression. Cyst found, containing mass, an inch in diameter, which proved to be brain-substance. Recovery.

2. *Fitzgerald.* (Cited from the "Melbourne Age," an ordinary newspaper, by Senn, in "Annual of the Medical Sciences," 1888, Vol. II.) Girl, 16. Loss of sight right eye; partial paralysis; convulsions. Left temple trephined January, 1887. Trocar thrust into brain, and fluid of an echinococcus cyst withdrawn. Recovery up to time of report.

3. *G. M. Hammond and Roberts.* ("Boston Medical and Surgical Journal," May 5, 1877.) Woman, 29. Pain over right ear; convulsions limited to left side; left facial paralysis, increasing to hemiplegia; agonizing headache; sensation good; reflexes exaggerated; optic neuritis. Trephined March 30, 1887. Hypodermic needle inserted, with no results. Death from shock in twenty-one hours. Three cysts close together, involving face, arm, and leg centres.

4. *Macewen.* (Art. cit., Case 8.) Man, 22. Eight years before, injury to head; paresis right arm; frequent convulsions of tongue, right face, and platysma. Cyst, size of filbert, involving cortex and subjacent white matter, removed from base of left ascending frontal. Recovery. No fits; paralysis improved.

To sum up, therefore, we have the following results: —

Situation.	No. of Cases.	Recovered from Operation.	Died.
Frontal lobe	1	1	0
Rolandic region	10	7	3 (2 septic, 1 shock.)
Occipital lobe	1	0	1 (1 hemorrhage.)
Cerebellum	3	0	3 (3 shock.)
Total tumors	15	8	7
Exploratory trephining	5	2	3 (1 respiratory failure. 2 shock.)
Cysts	4	3	1 (1 shock.)
	24	13	11

Classifying the fifteen tumors actually removed by the nature of the growth, we have the following results: —

Nature of Growth.	No. of Cases.	Recovered.	Died.
Sarcoma	3	2	1 (1 occipital.)
Glioma	4	1	3 (2 Rolandic, 1 cerebellar.)
Tubercle	5	2	3 (1 Rolandic, 2 cerebellar.)
Fibroma	1	1	0
Fibro-lipoma	1	1	0
Not stated	1	1	0
	15	8	7

2. *The Advisability of Operating with Reference to the Accessible Regions of the Brain, and the Relative Frequency of Tumors in these Regions.*

The hopeless prognosis of cerebral tumors renders it advisable, in every case of cortical tumor which can be localized, to attempt removal by operative measures as soon as possible. As a rule, of course, it is well first to give the patient the benefit of the doubt and of iodide, — and iodide has not been given until the dose has reached at least three drachms a day, and better, six. After a fair trial of iodide, there should be no further delay in operating; for not only does each day's delay add to the patient's weakness, but in every case of tumor there is the danger of sudden coma and death. The fatal result in the present case was due, in part at least, to the poor condition of the patient; and the same may be said of several of the cases cited above. Had the operation been undertaken, as advised, in April, 1887, the chances would have been much greater.

It is a self-evident proposition that those tumors alone are accessible to operation which are near the surface of the brain. It is not probable that any advance in cerebral surgery can make it possible to cut into the optic thalamus, the corpora quadrigemina, or the pons with safety, The cases thus far operated on, however, indicate that it is possible to remove cortical tumors, and even tolerably deep-seated sub-cortical tumors, from any part of the external surface of the cerebrum, especially in the Rolandic region, and the percentage of success thus far obtained proves that the operation is a justifiable one. Of course, tumors in the convolutions at the base of the brain, and on the median aspect of the hemispheres, must remain inaccessible.

Although the external aspect of the cerebrum is accessible to the surgeon, it unfortunately happens that our present knowledge of cerebral localization does not enable us to determine the situation of neoplasms in every part of the cortex. At present we can diagnosticate with accuracy lesions involving the ascending convolutions, and the parts of the frontal

and parietal convolutions immediately adjacent, lesions of the posterior part of the first temporo-sphenoidal convolution on the left, lesions of the occipital lobes involving the cuneus, and, perhaps, lesions in the inferior parietal convolution and the angular gyrus, — rather a limited portion of the region accessible.

Unfortunately it only too often happens that tumors are situated, not in these regions, but in the inaccessible parts. Out of four hundred and eighty-five cases collected by Bernhardt,[14] only fifty-seven were in the cortex; and on examining the summaries of the reports of these cases, it seems as if twenty-seven might have been localized. Out of these twenty-seven cases, in three there were growths elsewhere; in two there was also tubercular meningitis; and in one the growth was a cancer, — leaving twenty-one possible cases. In one hundred and twenty-four cases of tumors of the white substance of the cerebrum I find fifteen more which might probably have been localized; but in one of these, again, the growth was a cancer, and in one the tumors were multiple, leaving thirteen cases. Thus, out of four hundred and eighty-five cases, thirty-four, that is, seven per cent., might possibly have been localized successfully, and have been more or less accessible to the knife; but it is not easy to say, from the tables of Bernhardt, just how deeply seated the cases in the second category were. The estimate that I have made errs rather through being too liberal. The examination of Mill's and Lloyd's[15] table of one hundred cases is rather more favorable, for ten of these seem to have been cases that could have been operated on.

Hale White,[16] in an elaborate analysis of one hundred autopsies of cases of tumor of the brain at Guy's Hospital, thinks that, including cerebellar growths, ten might well have been operated on, but six of these were cerebellar. In four more, one of which was cerebellar, an operation was possible. On the one hand, however, he excludes very large tumors which can, perhaps, be successfully removed, and also infiltrated growths, which, as is shown by Horsley's case (Case 4, above), may sometimes be in part removed with temporary benefit; but, on the other hand, in the absence of clinical histories, we do not know in how many of these

cases symptoms existed which would permit of localization.

Starr[17] has recently made an admirable study of three hundred cases of tumor in children, with special reference to the question of surgical interference. Out of these three hundred cases he finds that fifty-six involved the cortex or the centrum ovale; of these he found that forty cases gave sufficient data to draw some conclusion from. Of these forty cases an operation was indicated in nineteen; but it would have succeeded in only sixteen (five per cent.), two being infiltrated, and one multiple. In adults, however, Starr finds that cortical and subcortical tumors are relatively more frequent than in children, in whom, on the contrary, cerebellar growths are commoner.

The chance for operative treatment of cerebral tumor, therefore, is not great, the percentage of cases situated in accessible regions, and giving rise to definite focal symptoms, varying from five to seven per cent., if we exclude tumors of the cerebellum. It seems safe to say that, as a rule, in five per cent. of the cases the tumor can be localized and removed, and of these about one-half recover.

It is still a question whether the surgeon is justified in attempting to remove cerebellar growths. All these cases where removal has been attempted have died of shock, but two of the cases were *in extremis*. Starr concludes that in about one-third of the cases the surgeon can reach the tumor; that the operation is essentially exploratory, and is much more dangerous to life, and in estimating his percentage of cases, as quoted above, he does not include cerebellar growths. We might naturally hesitate, therefore, before operating; yet no definite decision can be reached until the operation has been performed on patients who are in good condition at the time. One thing must be said as to cerebellar tumors: they are more common in children, and are very apt to be tubercular. Such growths may become encapsulated, and remain quiescent for a long time. I saw a little boy, two years ago, who had all the symptoms of a cerebellar tumor, which was probably tubercular, and he is still alive, and better than he was when I first saw him. In

such a case an operation might deprive the patient of several years of a tolerably comfortable existence.

If we add cerebellar growths, our percentage of operable cases becomes larger. Hale White gives seven cerebellar tumors which might have been operated on, out of a total of one hundred. Starr finds ninety-six cerebellar tumors out of three hundred in children, about one-third of which could have been removed. Mills and Lloyd give nine cases out of one hundred, four of which could have been localized, and three removed. Bernhardt gives ninety out of four hundred and eighty-five, of which forty-one, making a very liberal estimate, might have been localized, and nineteen removed. Thus, about three or four per cent. of all cases are cerebellar growths which can be localized and removed. Adding these, then, the total percentage of removable tumors is from eight to fifteen per cent. at the largest, and about half survive the operation.

We see, therefore, that the operation is advisable in tumors situated in the cortex cerebri, or just below it, provided they give rise to symptoms which enable us to localize them, and we must also bear in mind that the local diagnosis is by no means absolutely certain. The percentage of cases which can be localized and removed is and necessarily must remain very small, probably below seven per cent. The advisability of removing cerebellar growths is still doubtful.

3. *The Advisability of Operating with Reference to the Nature of the Tumor.*

As I have just said, the diagnosis of the nature of an intra-cerebral growth can seldom be made with even a probability of success, hence the contra-indications can seldom be of value. It is obviously useless to attempt to remove carcinomata, for they are almost always secondary in the brain. All agree that gliomata and sarcomata should be removed, although the former are very often infiltrated, — a fact which never can be foretold. Even in such cases an operation may benefit, as Horsley has shown. In regard to tubercles and gummata, there has been considerable controversy. Gummata sometimes yield to anti-syphilitic treatment, although

most men of much experience know that this is not always the case. Seguin points out the tendency of gummata to persist as inert tumors after most thorough specific treatment. Such he believes, in spite of the dicta of Hale White and Bergmann, should, after the failure of mercury and iodide, be removed.

Wood[18] has lately argued that iodide will remove the gumma, but a cicatrix of connective tissue may be left behind, keeping up the symptoms. Any operation to remove the cicatrix will simply convert a medical cicatrix into a surgical cicatrix, and do no good. It seems a question still, whether iodide will entirely remove the gummatous deposit; and the result of the removal of traumatic cicatrices in epilepsy certainly shows that the scar of an incision into the cortex, a surgical cicatrix, does not give rise to any symptoms to be compared with those arising from the dense connective tissue formations that follow injuries or absorbed gummata.

Bergmann takes equally strong ground against operating on tubercles, for the reason that the operation cannot be complete, a recurrence will follow, the dissemination of the morbid growth over the meninges will give rise to tubercular meningitis, and finally cerebral tubercle is often merely one local manifestation of a general infection. Bergmann's objections might also be raised against the excision of tubercular glands or tubercular joints, and they lose weight when we recall that two of the successful cases in the above list were tubercles, Macewen's being especially unfavorable from the presence of nodules in the pia. Of course, if there be general tuberculosis, no operation is advisable. In the present case, with a growth so thoroughly encapsulated, and with the surrounding tissue apparently so healthy, the risk of local infection seems slight. Carcinoma, therefore, is the only form of tumor which contra-indicates operation.

Senn[19] is disposed to believe that optic neuritis is a contra-indication for the operation. With it, of course, the patient, if he recover, will probably have poor vision, but it is not of prognostic value as regards recovery from the operation. Amidon's, Godlee's, and Hirschfelder's patients had it, and Keen's patient had had it and had the subsequent atrophy.

REMARKS ON CRANIO-CEREBRAL TOPOGRAPHY.

Hare[20] has stated that if we attempt to mark out the position of the cerebral fissures on the skull, by making fixed measurements from imaginary base-lines or bony prominences at the base of the skull, we are liable to error in extraordinary cases; although, as a rule, such measurements may be fairly accurate. I therefore adopted the Thane-Horsley method, as modified by Hare, using a cyrtometer made by Leach and Greene, under the directions of Dr. J. C. Warren. From curiosity I also marked out the fissures by Broca's method, as given by Seguin,[21] and by Reid's method, as given by Bastian,[22] both of which are open to Hare's objection; but the latter method gives rules for marking out more of the lesser sulci than Horsley gives.[23] Dana's exhaustive paper[24] had not then appeared.

The fissures of Sylvius and Rolando, and the two frontal and the precentral sulci, were marked out on the right side of the head. Reid's method coincided pretty closely with Horsley's; but Broca's line for the fissure of Rolando began almost an inch farther forward, and ran off from the median line at a much greater angle, crossing the line laid out by the cyrtometer.

On making certain measurements on a skull while drawing one of the illustrations to this paper, I found that the actual bregma was about three-quarters of an inch in front of the place where it ought to be by Broca's method. I therefore, with the help of Dr. J. A. Jeffries, measured, as accurately as possible, fifty skulls in the Warren Museum. These skulls were of different nationalities: 8 Hindoo, 7 African, 1 Chinese, and 34 American or European. The measurements gave the following results: —

The line fell $\frac{1}{4}$ inch behind the bregma in . .	2
" " " on the bregma in	21
" " " $\frac{1}{8}$ to $\frac{1}{4}$ inch in front of the bregma in	5
" " " $\frac{3}{8}$ to $\frac{1}{2}$ " " " "	17
" " " $\frac{5}{8}$ to $\frac{3}{4}$ " " " "	4
" " " $\frac{7}{8}$ " " " "	1
	50

These results led me to test Broca's method on the living subject; and I therefore applied a flexible square, according to the regular method as given by Dana, on twenty-five adult male patients at the Boston City Hospital, on whom I could readily feel the bregma. The results were still more at variance with the theory.

The line fell $\frac{1}{2}$ inch behind the bregma in . .	2
" " " on the bregma in	8
" " " $\frac{1}{8}$ to $\frac{1}{4}$ inch in front of the bregma in	2
" " " $\frac{3}{8}$ to $\frac{1}{2}$ " " " "	5
" " " $\frac{3}{4}$ to 1 " " " "	7
" " " $1\frac{1}{2}$ inches " " "	1
	25

Broca's method for finding the bregma being thus shown to be utterly inaccurate, it becomes still more untrustworthy when we remember that the top of the fissure of Rolando is not fifty millimetres behind it; but, as Dana has shown, it may be anywhere between forty and sixty millimetres. In large growths, as in Horsley's ninth case (Case 5, above), or in Keen's case, if we open the skull by any rule-of-thumb method, we shall be likely to come down upon the tumor; but when we wish to be accurate, we must discard Broca's method. The fullest and most accurate methods are the modifications of the Thane-Horsley method, as given by Dana.

IV. SURGICAL CONSIDERATIONS. (DR. BRADFORD.)[1]

So few cases of operation of tumor of the brain have been reported in detail as yet, that a surgeon preparing for this operation cannot be guided by accepted tradition, and the problems of the detail of the operation present themselves to his mind without the guidance of extensive formulated experience. The following questions which he has to consider, apart from the question of localization or the propriety of operation, suggest themselves: —

[1] Dr. Bradford is indebted to Dr. E. G. Brackett for his assistance in preparing this article.

First. The size and situation of the flap.
Second. The extent of the opening in the cranium.
Third. The exploration of the brain.
Fourth. The avoidance of hemorrhage.

Of the preparation of the patient for the operation little need be said. The whole head should be shaved, the line of localization should be marked with nitrate of silver, and an antiseptic dressing applied. The patient's bowels should be thoroughly moved the day before the operation, and an enema given the morning of operation. The usual aseptic and antiseptic precautions should be observed rigidly.

The use of ergot and morphine before the operation, according to the suggestions of Dr. Keen[25] and Mr. Horsley,[26] would seem at present an advisable precaution, although it may be doubted (as suggested by Nancrede[27]) whether these precautions are always necessary, and whether they may not, in some instances, increase the danger of shock. They, however, in the present state of our knowledge of the surgical technique of the operations, will be adopted by most surgeons as safeguards — and morphine diminishes the amount of anæsthetic needed.

THE USE OF AN ANÆSTHETIC.

Ether was used in the case here reported. In view of the result, namely, death from shock, it is possible that chloroform might have been preferable; but the difference in the stimulating effect on the circulation between chloroform and ether is slight, and the greater risk of the former was the reason of the choice of the latter anæsthetic.

1st. *Size and Situation of the Incision of the Scalp.* — All writers are agreed that a semicircular incision is better than the old crucial incision. In the case here reported, the skin was divided by a large semicircular incision reaching from the temporal region downwards and backwards, and ending at the vertex, the convexity pointing towards the occiput. The undivided portion of the skin was about four inches in length, from the beginning to the end of the incis-

ion. This incision has the disadvantage of dividing the vessels of the scalp in the temporal and occipital regions, and, as suggested by Mr. Horsley, an incision is preferable with the convexity pointing upwards and backwards so that the vessels of the scalp may be cut across as near to the terminations as possible.

The incision should be made down to the bone and the flap drawn back quickly, containing as much of the periosteum as can be readily separated.[1] Previous to the incision and reflection of the scalp, it is desirable that the skull be carefully marked at the exact site for the application of a trephine, and for this purpose a small drill can be used; perforating the scalp and entering the skull at the point at which it is desired that the trephine be applied, so that after the removal of the flap the point of election marked on the flap may not be lost. A ready way has also been suggested by Dr. Park,[11] viz., driving in a small tack.

The question of controlling hemorrhage in an incision of the scalp is an important one.

In the case here reported, an attempt was made to control the bleeding vessels by means of acupressure, but the method was not found convenient. The application of a rubber tube tightly around the whole skull, just above the eyes and occiput, suggested by Starr and used by Weir,[6] will be found more reliable. This will not stop all bleeding, but it will diminish bleeding, and is a ready and simple method. The size of the flap varies necessarily with the size of the suspected tumor, but where an opening of two inches in the cranium is to be made the base of the flap should be at least four inches.

2d. *Opening of the Cranium.* — The most convenient way of opening the cranium will probably remain by the use of a large trephine, although a surgical engine, not within the reach of every surgeon, will undoubtedly be a help to those who are accustomed to its use. Ordinarily, for surgeons,

[1] Macewen has recently made a nearly semicircular incision through scalp periosteum and bone, without detaching the scalp, and then forcibly raised the flap, bone and all, breaking the bone at the undivided part; thus preserving the button of bone from the greater danger of necrosis in trephining. — *McKann, Pittsburgh Med. Review*, 88, ii. 217.

either a large two-inch trephine will be the most convenient for use, or, in case a trephine of this size is not to be had, two trephine holes, close to each other. and the use of a rongeur and Hey's saw, will answer.

The latter method, however, causes some delay, and speed is to be considered in this, as in all capital operations.

The button, when removed, should be placed in a warm, aseptic solution, kept at blood-heat by means of a water-bath, in order that the button be reapplied, as in the cases reported by Macewen and Burrell.[28]

The prevention of hemorrhage on the opening of the dura is not a matter of great difficulty if the trephine has been carefully used, for, except in cases of adhesive meningitis, the dura can readily be separated from the skull. Where the trephine is placed over the middle meningeal or the sinuses, the trephine should be applied with great care and the button removed, so that there is no possibility of tearing the dura. If this is done, the middle meningeal can be secured by passing a curved needle around it and tying it before incising the dura. The same is true of the sinuses.

The dura should be opened by a semicircular incision, one-fourth of an inch from the inside opening of the skull.

The dura may be opened by first lifting a part with a tenaculum, penetrating it with a knife, and then cutting $\frac{1}{4}$ with blunt, curved scissors $\frac{1}{4}$ inch from the skull edge. This incision was extended $\frac{3}{4}$ of the circumference, the intact portion being above.

When the dura is at all adherent it must be freely incised. — *Horsley.*

3d. *Exploration of the Brain.*—In the case above reported the brain was explored with the finger. An exploring needle was introduced first, as it was evident, from the bulging of the brain, that exploration was necessary. Nothing, however, was learned by the exploring needle, and where a cyst or abscess is not expected an exploring needle is useless. In the majority of cases the finger is the best searcher, and, if carefully guided, is the least injurious.

In the present case the cortex was incised for half an inch, and the finger carefully introduced to a depth of three

inches. It is difficult to imagine that in any case of tumor of the brain any method of exploration other than the finger can be satisfactory. The consistency of a tumor is either harder than the ordinary brain-substance, or is softer. But the degree of difference of consistency is so slight that it will escape detection at the end of a probe or exploring needle. In all probability, after increased experience in this class of cases, the surgeon will be able to determine, with some degree of exactness, what may be termed the surgical topography of the brain.

At present, however, it is not easy to detect by means of the exploring finger more than a difference of consistency and the extent of this difference. The separation by means of retractors of the incision in the cortex for exploration ot the deeper tissue is of but little assistance, and is not free from the danger of too great injury to the brain-substance.

In cases of imperfect localization it is probable that a second incision in the cortex and a second introduction of the finger would be of less danger than the too extensive use of retractors.

Bulging of the brain-substance into the skull opening is a valuable sign of deep-seated tumor, but its absence cannot be regarded as trustworthy negative evidence, as has been shown in several cases. A slight yellowish tinge, or the opposite, a slight lividity, are indications of the presence of tumor beneath in the corona.

In feeling for the growth, firm pressure, sufficient to carry the finger below the skull level, or permit it to pass beyond the skull opening, can be made. Further examination is permissible by gently separating the convolutions by the finger-nail and a director, by which means palpation beneath the level of the convolutions is possible.

Exploration by a needle through the unopened dura is not advisable.— *Weir*. Even after the dura is cut, this is of doubtful value, as a growth too soft to be felt by the finger would hardly give an appreciable resistance to the exploring needle, and, on the other hand, fatal hemorrhage has followed this procedure.

4th. *Stopping Hemorrhage*. — Hemorrhage will always

constitute the accident of this operation chiefly dreaded by the surgeon.

Hemorrhage from the incisions of the scalp can, as has been stated, be checked by the use of the rubber tube about the head.

Bleeding from the diploe, or cut bone, is rarely dangerous, but in a few instances it has proved not only a troublesome, but a serious complication. It can be checked by sponge pressure, or, in case of larger openings in the bone, by means of the insertion of small plugs of wood or sponge.

Bleeding from the sinuses can be avoided by care in manipulation. In removing the section of bone, the dura should not be torn. If a sinus pass under the trephine opening, a curved needle should be passed through the dura and a ligature tied around the sinus before the dura is incised. The sinus, if adjacent to but not under the opening, may be exposed by drawing on the dura and separating it from the skull by a director. The same procedure checks any bleeding from the middle meningeal.

Vessels in the pia can be tied by separating them by means of a director from the cortex and then gently raising them. Great care is necessary to avoid pulling too hard on the ligature, cutting through the vessel. Gentle traction, just sufficient to arrest bleeding, answers best. Slight dural hemorrhage may be controlled by pressure obtained by iodoform gauze pressed between the dura and skull.

For bleeding from cerebral vessels, caused by removing adherent dura, a solution of cocaine is useful, and solutions of antipyrin have also been used, but these must be made purely aseptic.

For troublesome hemorrhage from cerebral vessels, which are too deep to tie, Weir advises using clamps, which may be left *in situ* for a day or two. This, however, of course, excludes the possibility of healing the wound by first intention.

Weir regards this as better than packing with tampons. The latter will, of course, be necessary where bleeding points cannot be found.

The cautery should never be used to control the hemorrhage.

REMOVAL OF THE GROWTH.

An encapsulated tumor may be easily shelled out with the finger and director, or, if this fail, by a Volkmann spoon, the edges of which have been blunted; also, growths which are not encapsulated may be removed in this way, with comparative ease.

In one case reported the tumor was larger than the skull opening. In this it was incised, and some of the contents pressed out. This brought the boundaries of the tumor within view.

TREATMENT OF THE WOUND.

The question of drainage is an important one. For some hours there is an oozing of blood and serous fluid.

Horsley at first insisted upon the necessity of a drainage-tube, carried to the bottom of the cavity, but also emphasized the necessity of its early removal (in twenty-four hours). He more recently advised an early closure, and drained, by leaving a portion of the flap, at the most dependent portion unsewed, relying on the arachnoid to absorb.

Weir, on the other hand, is inclined to leave the tube for two or three days, especially if the case is doing well.

The question of proper drainage cannot to decided arbitrarily, but will depend for its solution on the individual case.

The dura is stitched with catgut, except at the place of exit of the tube.

During the operation the buttons and fragments of bone are kept in an antiseptic solution, carbolic or bichloride, 1–2000, and at a temperature between 100° and 105° F. These are then replaced over the severed dura. Horse-hair or strands of catgut are placed beneath the flap, for drainage, and a thorough antiseptic dressing is put over all.

After removal of the tube the fluid may accumulate and cause tension. In this case, if it be found necessary to relieve this, the path of the tube can easily be opened with a

probe. Horsley considers the advisability of this — a question to be decided in each case, — there being both advantages and disadvantages in so doing. Opening relieves the tension and the attendant symptoms, but does away with immediate healing of the wound as a whole.

But tension has certain advantages: (1) It allows entire healing by first intention, causing the lymphatics to absorb. (2) This material acts as a kind of scaffolding for the building up of normal connective tissue.

Change of Dressing. — In Keen's case the dressing was done twice daily for a few days, as bleeding and oozing continued. The rules which apply to other aseptic and antiseptic dressings will guide in these cases.

DEATH AFTER OPERATION.

The causes of death after operation are as follows: —

1st. Shock from operation.
2d. Septic inflammation.
3d. Hemorrhage.
4th. Œdema of the brain.

The first of these can be prevented in many cases by dexterity in operative detail and by judgment in selecting cases for operation. Septic inflammation is preventable, and, with proper care as to cleanliness and drainage, should not appear as the cause of death. The precautions against hemorrhage have been mentioned.

There seems to be no means as yet of preventing the fourth cause of death, viz., œdema of the brain, which is urged by Bergmann as a serious objection to the operation. Statistics, however, hardly support the opinion that tumors of the brain should not be operated upon; and the record of traumatic surgery shows that large cranial openings and loss of brain-substance can occur and be followed by complete recovery.

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AMPUTATION OF THE HIP-JOINT.

By E. H. Bradford, M.D.

Amputation of the hip-joint has been performed six times at the City Hospital since the last hospital report.

The following is a brief summary of the histories of the cases: —

Case 1. Male. Adult. Amputated at the hip-joint by Dr. Gay, Feb. 16, 1883, for sarcoma, recurrent in stump after amputation at upper third of thigh. Complete recovery from amputation. Death a month later from an intercurrent pneumonia.

Case 2. Amputation was performed by Dr. Bradford for sarcoma of the thigh on a young man 17 years of age. Six weeks before his entrance to the hospital a swelling was noticed in the thigh, at the junction of the upper middle third, which slowly increased in size. Previous to that he had suffered from sciatica for several months. There was intense pain at times.

Diagnosis of periosteal sarcoma was made, and amputation was performed Nov. 6, 1884. But little shock followed the operation, and the wound healed by first intention.

Patient in three weeks was able to stand on crutches.

The tumor, however, reappeared shortly afterwards, and the patient died from a recurrence of sarcoma a month later.

Case 3. A woman, 37 years of age, underwent amputation of the hip-joint for very large sarcoma of the thigh.

Four months before the operation, amputation had been advised, but had been refused by the patient, who later reentered, in February, 1887, on account of great increase of tumor, severe pain, œdema of the foot and ankle.

Patient bedridden on account of size of tumor.

Amputation of the hip-joint performed by Dr. Bradford; the patient died three and a half hours afterwards.

Case 4. A man, 24 years of age; extensive periostitis and ostitis of the femur. Patient amputated by Dr. Post at the hip-joint, June 17, 1887. Discharged, stump entirely healed, Aug. 20, 1887.

Case 5. A boy, 13 years of age, suffering from hip disease of some years' standing; incision had been performed, but without benefit.

Amputation by Dr. Gay was performed June 7, 1887. One month after excision much shock followed amputation, and temperature fell to 95 degrees immediately after the operation, but soon increased to normal. Patient recovered, and left the hospital July 5. Patient subsequently died of tubercular meningitis.

Case 6. A man, 26 years of age, with extensive necrosis of the femur. Amputation by Dr. Gay at the hip-joint, June 7, 1887. Very little shock followed the operation, and the patient made a good recovery, and was discharged August 20.

Of these six cases, but one died from the operation, and in the fatal case the operation was undertaken as a desperate attempt to relieve the patient from a condition of suffering. The result proved that operative interference was not warranted. Of the other five cases, all recovered from the amputation. Three of these have died subsequently, — one from pneumonia, one from reappearance of tumor, and the other from tubercular meningitis. Their chances, however, were improved by the operation. The other two patients are living at the present time.

One of the five was an amputation after excision. This patient died of tubercular meningitis.

In addition to these cases, a seventh case may be reported, — that of a man who recently entered the hospital for a gonorrhœal bubo.

He presented an excellent stump after amputation of the hip-joint, performed by Dr. Gay ten years before, for extensive necrosis of the femur. The case is mentioned in the preceding City Hospital Record. The patient's stump was entirely free from sinuses, and on palpation a resisting mass resembling bone or thick calcified tissue could be felt in the

centre. The muscles attached to this could be contracted at will, but the stump was not large enough for the attachment of an artificial limb. The writer will also call attention to a successful case of amputation of the hip-joint, after excision

Successful amputation at the hip-joint.

for hip disease done by him, reported in the Boston "Medical and Surgical Journal," Feb. 24, 1887, page 180. The patient is alive at the present time, and in excellent condition of health.

A second similar case underwent amputation and recovered, but died six months later of amyloid disease of liver and kidney.

Of these nine cases, three were amputations following excisions for extensive hip-joint disease with pelvic caries. In all these the amputation was successful, but in two the patients died from the progress of the carious disease.

Of the cases of sarcoma, one died from the operation; the other recovered from the amputation, but died of recurrence of disease. A third died from pneumonia, after recovery from the amputation.

The three cases of necrosis of the femur all recovered, and remained well.

A comparison of these results, nine cases and one death, with those in the former City Hospital reports show more favorable results than that previously obtained.

Ashurst has collected thirty-four cases of primary amputation of the hip-joint for hip disease, and thirty-one cases following excision. In these, death occurred in nineteen cases. In five cases the result was undetermined, thus giving a mortality of 32 per cent. of amputation following hip-disease. Of the twenty-two cases of amputation for hip disease collected since Ashurst's tables were published, death occurred in but three, — a mortality of only 14 per cent.

Out of these thirty-three cases of amputation of the hip-joint for all causes collected by Ashurst ("International Encyclopedia of Surgery," Vol. I., page 677), the mortality in pathological cases was 40.2 per cent.; that of traumatic cases was 82.4 per cent.

Of twenty-seven cases of amputation at the hip-joint for disease the mortality was 41.1 per cent, and that of reamputation of the hip-joint of the previous thigh stump was 33.3 per cent.

Amputations of the hip-joint present difficulties greater than that of any other amputation, for two reasons, viz.: —

1st. On account of the danger of hemorrhage.

2d. On account of the danger of shock.

A large number of procedures have been advised for this amputation (some forty or more having been described), but almost all of these may be discarded as inadvisable.

It may be said that there is little difficulty in thoroughly draining the wound, or of obtaining sufficient flap.

The avoidance of shock is to be sought for in relative speed in performing the operation, to be gained by careful preparation previous to operating, and the proper drill of assistants.

Of the methods for controlling hemorrhage, three may be mentioned: First, digital compression; second, the employment of the wooden lever in the rectum; third, the use of elastic bandage, as recommended by Mr. Lloyd ("Lancet," May 26, 1883).

The method of preliminary ligature of the femoral artery is inadvisable, for two reasons: that it delays the operation, and does not control the hemorrhage from the gluteal muscles.

Trendelenberg's method of compressing the flaps by means of a rubber tube placed over the thigh, and wound around both ends of a steel rod passed through the thigh, the vessels being compressed between the rod and tube, presents no advantages over elastic compression properly applied, and is hardly to be recommended. Digital compression over the femoral may be used in children, provided the assistance of a thoroughly skilled surgeon may be obtained; but even under these circumstances it is impossible to check all bleeding, a matter which is desirable in patients undergoing this operation.

In the cases here reported, hemorrhage was checked by the use of an ordinary elastic compression introduced by Esmarch.

A strong rubber tube is passed around the groin, being applied as high in the perineum as is possible, and tied around the thigh just above the trochanter. The tube should be a stout one, and should be thoroughly applied. It may be tied in a hard knot, or secured by means of a string tied around the overlapping ends, firmly, as is mentioned by Gerster. It should be intrusted to a skilled assistant, who should be instructed to hold it above the trochanter, passing, if necessary, the bandage underneath the tightened rubber tube and pulling upwards on it, thus counteracting the tendency of the rubber band to slip below the trochanter.

If the thigh is very large, it may be necessary to apply a rubber band at first above the crest of the ileum.

After the preliminary excision of the head of the femur, a sponge may be placed in the excision wound, and the rubber bandage applied below the crest of the ileum and above the trochanter, as has already been mentioned.

The best method of amputation is practically that recommended by Furneaux-Jordan. The head of the femur is rapidly excised in the ordinary way, the long incision is prolonged down the femur, and a few inches of the head of the femur turned out.

The femur should be rapidly separated from the muscles for two inches along the shaft, preserving the periosteum as far as possible.

The circular amputation of the thigh is then made rapidly, and the outer part of the circle crossing the prolonged incision for the excision of the head of the femur, and the inner part extending a short distance below the perineum. If the Esmarch bandage is properly applied, there will be no loss of blood, and the large vessels will be easily seen and secured. The other bleeding points may be controlled as the Esmarch band is gradually loosened.

The ordinary antiseptic and aseptic precautions are, of course, necessary.

Re-formation of bone from the periosteum may be expected in a few cases. *Vide* "Boston Med. and Surg. Journal," Feb. 24, 1887; also, "Clinical Society Transactions," 1882–83, Vol. XVI., pages 6, 258.

A method for the rapid forcible reduction of subluxated tibia in chronic diseases of the knee-joint. (E. H. Bradford, M.D.)

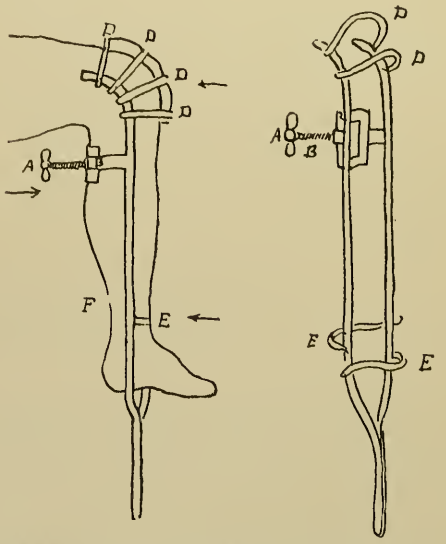
The patient, a woman 24 years of age, with a right-angle contraction of the knee-joint for tumor-albus, eighteen years before. There was marked backward subluxation of the tibia.

The patient was unable to step at all upon the limb. Forcible correction of the subluxation was made with the help of a mechanical appliance, to be described, with complete cor-

rection of the subluxation. The limb was fixed in a plaster-of-Paris bandage immediately. It was found after correction of the subluxation that a marked genu-valgum followed, due to the lengthening of the internal condyle, a result of the disease.

Two weeks after the first operation the patient was again etherized, and Macewen's operation for knock-knee performed with success. Three months afterward the patient was discharged from the hospital with a straight limb. At that time she was able to bear all, or nearly all, her full weight upon the limb. A year later she could walk without a crutch or cane. There was no subluxation of the tibia, and but an inch shortening, from arrest of growth of the limb. The accompanying diagrams illustrate the appliance used, which is based on the principle of an osteoclast.

Vide Transactions, "Ninth International Medical Congress," Vol. III.



Apparatus for forcible correction of subluxation of tibia.

Pressure forward of the head of the tibia is exerted by turning the handle A; this, by means of the screw force, pushes the plate C forward, working through the band B. The muscles protect the artery and the nerve from injurious pressure.

Counter-pressure is secured by means of leather straps, D and E, which are passed respectively over the knee and leg, protected by a thick layer of saddler's felt. Another strap under the leg secures the lower part of the leg. The side bars and plate of the apparatus should be all strong steel. The apparatus is put on the limb in a flexed position, and after rupturing adheres by forcible flexion, if that is needed, the patient being under complete anæsthesia. The head of the tibia is pushed forward as far as is advisable, and by means of the head of the appliance, which serves as a handle, the leg is extended. The pressure forward of the head of the tibia can be increased if necessary, and the place of counter-pressure regulated by loosening such of the straps D D as the extension of the limb may tighten too much.

Nothing here need be said in favor of the operation of Brisement force; but it is well known, in cases of subluxation of the tibia, the subluxated tibia can be reduced simply by this method.

From experiments on the cadaver, which were conducted through the courtesy of Dr. C. B. Porter and Dr. Dwight, it was shown that by means of this appliance the tibia could be pushed forward to any desired extent. On normal joints the tibia can be pushed forward to a considerable distance without rupturing the ligaments. The first to rupture was the posterior band of the crucial ligament. The tibia could be pushed forward over an inch without rupture of the interior band of the ligament, or of the posterior capsular ligament.

The objection to this appliance that is urged is the danger of rupture of the vessels and the danger of injury to the joint.

It is believed that neither of these dangers, in properly selected cases, is of importance.

The plate in the appliance is sufficiently broad to make a broad pressure on the gastrocnemius muscle, and the vessels here lie deeply.

If padding is placed over the lower end of the condyles, where the upper straps are applied, there would appear to be no danger of injury of the knee-joint proper from pressure,

except in cases of acute inflammation which are manifestly unsuited for a procedure. The use of the osteoclast has shown that there is no injury to the skin from the temporary pressure, such as is needed in this appliance.

The plate should be applied directly on the subluxated head of the tibia. If it is applied too low down along the shaft of the tibia, fracture may take place between the head of the tibia and the plate. In cases of bony anchylosis, the appliance is manifestly not of use. In cases of acute ostitis, it is also not of use. It will, however, be found of assistance in a limited number of cases. In addition to the cases here reported, the appliance was successfully used in a child of 12, of old disease of the knee-joint with subluxation.

FOUR CASES OF "WESTPHAL'S PARADOXICAL CONTRACTION," WITH REMARKS ON ITS MECHANISM.

I. DISSEMINATED SCLEROSIS.—II. LOCAL INJURY.—III. FOLLOWING SUNSTROKE.—IV. HYSTERIA FOLLOWING MALARIA.

By Morton Prince, M.D.

As is well known, when the tendons of certain muscles are suddenly stretched, a resisting contraction is excited in the muscle itself. As good examples as any of this are the knee-jerk and the ankle clonus. In contrast with this, Westphal has pointed out that, under exceptional conditions, a contraction lasting for some little time may be excited in the tibialis anticus, for example, not by stretching, but by *relaxing*, its tendon, as when the foot is suddenly flexed dorsally. Hence, in contradistinction to the first form of contraction, he has called this latter form the "paradoxical contraction." Considerable difference of opinion still exists regarding the mechanism of this contraction, as it still does in regard to that of the knee-jerk. Westphal's explanation is that the relaxation itself of the muscle is a source of irritation sufficient to excite a contraction.

Erlenmeyer[1] has disputed Westphal's explanation, on the ground that if the calf muscles be so manipulated that they cannot be stretched by dorsal-flexion of the foot, the contraction in the tibialis anticus does not occur, notwithstanding that it is completely relaxed. His method of accomplishing this is as follows: While the subject is lying in bed and the knee is bent, the calf is grasped firmly in the hand and pushed strongly towards the heel. In this way the muscles from the tendon to the belly of the calf are shortened, and

[1] Centralblatt f. Nervenheilkunde, 1880, No. 17, p. 345.

are not stretched when the foot is dorsally flexed. If this be done, the paradoxical contraction does not occur; and, conversely, if the contraction be first excited, the foot immediately drops in manipulating the calf muscles in the above way.

From this Erlenmeyer concludes that the contraction is not brought about by relaxation of the muscle itself, but is a reflex contraction, caused by stretching its antagonists, the calf muscles.

To all this Westphal[1] replies that he in the first place doubts whether a muscle can be shortened by the process described; and, in the second place, the results are to be ascribed not to shortening of, but to pressure upon, the gastrocnemius; for, if simply pressure be made upon the calf against the bones, without pressing downwards towards the heel, the same results are obtained, — namely, the paradoxical contraction does not occur, or is abolished.

Mendelssohn[2] explains the phenomenon by a rupture of the equilibrium of the tonus in certain muscular groups and their antagonists.

Charcot and Richer, who have studied the matter in hysterical subjects in whom they have found an analogous contraction, coincide with the views of Erlenmeyer and Mendelssohn, and believe that the contraction in question is a reflex contraction excited by the stretching of the antagonistic muscles. Their main reason for these views is found in the following facts: It is well known, they say, that in the patients they are speaking of (*i.e.*, hysterical) contraction can be obtained by various methods; massage of the muscles is one of them. Thus, if the tibialis anticus be kneaded, contraction soon sets in, and the foot is fixed in the state of dorsal-flexion; massage of the gastrocnemius brings about the opposite result. Under other experimental conditions, however, different and opposite results may be realized; and this is the point to which attention is particularly drawn. If whilst the calf muscles are kneaded the foot is supported so as to be prevented from yielding to

[1] Centralblatt f. Nervenheilkunde, 1880, No. 20, p. 417.

[2] Charcot and Richer, Brain, October, 1885.

their contraction, we soon see it rise and assume a position of dorsal flexion, the more marked the more prolonged the excitation of the gastrocnemius and soleus.

They conclude that when a muscle is stimulated, its antagonist is simultaneously excited, the latter having thus a regulating function; and that when the effect of the direct contraction is in some way impeded, the action of the antagonist may become predominant.

Then there are other ways of producing "paradoxical contraction," besides this mode just referred to. It may be produced in the foot, for example, by faradization of the tibialis anticus, and even by volitional impulses.

I have met with four cases in which this phenomenon was present, and, as such cases are comparatively rare, it is worth while reporting them here. Two cases, Nos. II. and IV., are unique.

Case I. is one of well-marked disseminated sclerosis, characterized principally by paresis, tremor of both hands, head and jaw on voluntary motion, and increase of the tendon reflexes. The tremor of the jaw is so violent that it is with the greatest difficulty that the thermometer can be kept in the mouth for the purpose of taking the temperature.

On flexing dorsally the feet and toes with the hand, the extensors are thrown into strong tetanic contraction. The tendons are seen to stand out prominently under the skin, and the toes and feet to be held in strong dorsal flexion for some minutes. The return to the original position is gradual. By volitional effort on the part of the patient the contraction can be overcome.

Case II. is one of considerable interest. The phenomenon is unilateral, and, as will be seen, depends on local causes. When the toes of the left foot are pressed upwards they are rigidly held by the extensor muscles for a number of minutes (five to ten?) in the position in which they are placed; these muscles are thrown into strong tetanic contraction, and can be seen to stand out sharply defined beneath the skin; to the touch they are firm and hard. When the foot, as a whole, is pressed upwards the contraction of the tibialis anticus which ensues is much less in degree. The foot almost immediately

begins to drop, and returns slowly to its original position in the course of five to ten seconds. Sometimes the foot during its return is attacked with tremor, as if the muscle only reluctantly yielded.

If, instead of passively pressing the toes up, the patient voluntarily raises his toes, they are seized in the same way with cramp of similar character and severity; likewise with the foot. So severe is this spasm that almost any effort to use his toes results in their being drawn upwards in strong tetanic spasm.

When this spasm has set in, the patient cannot for some seconds or minutes bend his toes, but if they and the foot be firmly grasped, and gently but slowly be worked back and forth, the spasm in a few seconds relaxes. Sudden and strong attempts to bend the toes downwards only tend to increase the spasm of the extensors; or at least are met with strong resistance. But if, while the muscles are relaxed, the toes be strongly bent (flexed) downwards, no contraction in the *stretched* extensors ensues, but when they are again raised, either passively or voluntarily, as soon as they arrive at a certain point they become "set," as the patient terms it, *i.e.*, firmly held by spasm.

The rationale of this spasm was not at first clear, but a little study cleared up the mystery.

The patient attributed the trouble to a gunshot wound of the toes, the ball being supposed to have hit the great toe and cut the flexor tendons of the others; but a careful examination failed to detect any scar or other signs of injury. The larger joint of the great toe was, however, tender, and it was noticed that the patient sought in walking to relieve this joint of pressure, by throwing his weight on the outer side of the foot, while at the same time he tended, as an associated movement, *to raise his toes from the ground.*

This constant action of the extensors of the toes, and in a lesser degree of the foot, was evidently the cause of the observed spasm. From being constantly thrown into contraction these muscles had become irritable, and any excitant, reflex or volitional, resulted in spasm.

A condition had been created similar in many respects to that of the muscles of the arm in writers' cramp.

The "paradoxical contraction" that here ensued on passively relaxing the muscles is beyond question a reflex spasm, originating either in a primary contraction of the calf muscles caused by their being stretched, or in an irritative impulse from the joints. That this latter may have been an active factor is suggested by the fact that in dorsally flexing the toes they became "set" at a fixed point, which seemed to correspond to the position in which they were held while walking.

That the flexor muscles of the toes (as is probably always the case) are also affected by spasm is evident from the position in which the toes are held. They do not, however, contract on being relaxed, as do the extensors. I think there is also a hypochondriacal element in this case, which tended to keep alive the tenderness of the joint for which there seemed to be no anatomical justification. The cramp on volitional action corresponds with what has been observed in other cases.

It should be added that this patient is blind in his right eye, the same being alleged as result of sunstroke some twenty-five years ago. The ophthalmoscope showed deep glaucomatous cupping and atrophy of disc. Left eye; fundus normal.

Case III. is not a pure form, neither the symptoms being persistent, nor the case characteristic of any known type of disease. There is a strong hysterical, or at least "functional," element in the case, with a tendency to exaggeration of symptoms from interested motives as a pension claimant. The patient attributes his condition to a sunstroke which he incurred during the late war. Principal symptoms are, dizziness, headache, and feeling of pressure on top of head. Staggers at times in the street, head seems to whirl round and he is obliged to catch hold of something to save himself from falling. Feels weak generally; unable to work. These symptoms have been gradually coming on since his sunstroke. One year ago obliged to give up work as a carpenter.

Tongue protrudes slightly to right; staggers to right with

eyes shut and feet together; voice slightly tremulous; pupils slightly unequal; hearing impaired, — more so, Dr. Leland reports to me, than can be accounted for by the coexisting catarrh of middle ear. Knee-jerks moderately exaggerated at times. No other signs, but he is at times nervous, excitable, and emotional. The "paradoxical contraction" is accompanied at times by spasm of the other muscles of the leg; sometimes cannot be incited at all.

Case IV. This case I had originally supposed to be one of disseminated sclerosis, characterized by exaggerative knee-jerks, marked paresis, and typical tremor. The patient ascribed his condition to malaria contracted during the war.

The "paradoxical" phenomenon was present in the extensors of the toes and feet. Momentary faradism to these muscles, as well as to the quad. femoris, was followed by tetanic contraction, which persisted after interruption of the current.

But what was most interesting about the case was this: massage of the tibialis anticus was followed by contracture of all the muscles of the lower leg, but that of the calf preponderated, *so that the toes and foot were strongly drawn downwards* (flexed). Continued massage was followed by dorsal flexion, though my notes are not explicit on this point. Friction of the skin over the tib. ant. produced the same result. Both massage and friction, though applied to the leg, caused also contraction in the quad. femoris. This patient I have here to-night, and you will see the picture has in some respects changed. It is some six weeks since I first saw him. The tremor, paresis, and exaggerated knee-jerks are gone. He says that his health has greatly improved, and he is able to work. But the phenomenon in question you will see still exists, though perhaps not in so marked a form as before.

On kneading the tib. anticus, or applying friction to the skin over it, you see contracture sets in; but the toes and foot are not drawn downwards as before, but upwards; that is, contracture occurs in the muscles massaged. Massage of the calf muscles is not followed by contracture.

The similarity between this phenomenon and that pro-

duced on hypnotic subjects by Charcot and others is striking. As is well known, the Salpetrière school report contractures following friction and massage as one of the phenomena of hypnotism. Other experimenters, those of the Nancy school, have failed to confirm these results, and claim that these contractures are caused by suggestion. In this case of mine I think suggestion out of the question, as when first examined I was as much surprised at the result as the patient, and I had only a vague idea as to what would happen; nor had a word previously been said on the subject by me to any one. The idea of massage only occurred to me at the moment I applied it. The disappearance of the other objective symptoms shows the case to be of a functional nature, with something of an hysterical element in it, possibly caused by malaria.

To return to the mechanism of this contraction, a study of the effect of passive and volitional motion of joints in normal subjects will throw considerable light upon it, if this be still required.

In the first place, it is absolutely impossible, by any action of the will, to contract the flexors or extensors of a joint without at the same time contracting in a lesser degree the antagonists. If we could contract the flexors of the wrist, for example, without doing likewise by the extensors, the hand would flop over upon the forearm, as in the dead subject when the tendons are pulled. The simultaneous action of the extensors evidently has a regulating influence. If, again, in the normal subject we *passively* move a joint like the ankle, that is served by a tendon (tendo Achillis) that responds to stretching, it is easy to demonstrate that not only the muscles that are stretched contract, but there is always more or less contraction in the relaxed antagonists; that is, when the foot is dorsally flexed, not only do the calf muscles contract, but the tibialis anticus contracts also, in a lesser degree. This observation I believe to be correct, and, though not easy always to make out, I have been able to demonstrate the fact on a number of normal subjects. When the foot is pressed upwards, if a finger of the other hand be placed over the tendon of the tibialis anticus, a

distinct, though momentary and sometimes slight, often pronounced, jerk upwards of that tendon can be felt. This jerk follows the upward flexion of the foot by a distinct interval, as if it did not occur until the calf muscles had been put upon the stretch. This interval between the pressing up of the foot and the contraction of the tibialis anticus tendon I have also found very pronounced when the paradoxical contraction was present, showing another point of resemblance between the two. In examining this contraction of the tibialis anticus in normal subjects, great care must be taken to eliminate the effect of volitional effort on the part of the patient, — not always an easy thing to do. From these facts I am disposed to regard the "paradoxical contraction" as *not entirely a new phenomenon, but only an exaggeration of a normally existing one*, and to agree with Erlenmeyer, that the so-called paradoxical contraction is not caused by a *relaxation* of the tibialis anticus, but is a reflex caused by the stretching of the calf, and possibly, I would add, by irritation of the sensory nerves of the joint. The difference between the normal and abnormal is one of degree, the mechanism being probably the same.

The nature of the pathological change upon which the increased irritability of the muscle in the abnormal phenomenon depends is as yet unknown.

The spasm of all the muscles moving a joint in any attempted movement is well observed in an inflamed joint. The spasm here is undoubtedly reflex, but the inciting impulses without question arise from the sensory nerves of the joint, as well as from the particular muscles that happen to be stretched.

Some further facts bearing on the mechanism of what I may call the antagonistic contraction are obtained from the phenomenon of hypnotism. It seems to be admitted that with subjects in the lethargic condition, and in some hysterical subjects, kneading a muscle is not only followed by contraction of the muscle kneaded, but its antagonists are, in a less degree, excited, an action that can only be reflex.[1] This was observed in Case IV., narrated above.

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[1] Binet and Féré, Le Magnétisme animale, p. 83. Charcot and Richer, op. cit.

The muscles in which this phenomenon is most commonly observed are, as has been said, the tibialis anticus and extensors of the toes. It has also been found in the flexors of the knee, and rarely in the arm muscles. In a case of hysteria or hypochondriasis in the male, I was able to obtain this contraction in the shoulder muscles as well as in the toes. It is fair to state, however, that I could not in the one examination allowed me, completely satisfy myself of the absence of all volitional impulse in this case. As Westphal remarks, there are some people who seem to be unable to allow a joint to be perfectly passively handled, any attempt to move it being followed by volitional contraction of the relaxed muscles. It requires great care to eliminate all fallacy from this factor.

The diagnostic value of the symptom is still undetermined. Westphal observed it in cases of tabes, and in others in which disseminated sclerosis could, with probability, be diagnosed, although typical symptoms, such as muscular rigidity and tremor, etc., were absent.

In the cases of tabes motor weakness was always present, so that it can be surmised that more than a pure posterior sclerosis was present. In other cases, in which the symptom was present, the clinical picture was so peculiar that they could not be classed with any known type of disease.

Westphal also observed the symptom in paralysis agitans.

Ross has found it in a case of hæmatomyelia, and Charcot and Féré, in certain forms of hysteria, as above mentioned. In no case has there been observed muscular rigidity or excess of myotalic irritability.

A CASE OF CONGENITAL DISLOCATION OF THE HIP SUCCESSFULLY TREATED.

By Abner Post, M.D.

Various attempts have been made in congenital dislocations of the hip to retain the head in the normal position. To succeed in obtaining such a degree of improvement as the existing condition of the head of the femur and the slight remaining excavation of the acetabulum will permit, requires a tedious confinement and more or less cumbersome apparatus. The following case is given as showing an exceptionally good result by very simple means.

It occurred to me while examining a series of these cases that it might be possible, in favorable subjects, to retain the head of the femur in its proper acetabulum long enough to secure its fixation at that point by a carefully applied bandage of plaster-of-Paris.

In May, 1884, M. R., a little girl of seven, was admitted to the hospital under my care with a congenital dislocation of the left hip. She was said to have hip disease by the physician who asked for her admission, but examination showed a limb freely movable without pain. The limb was greatly shortened, but could be pulled down to an equal length with the sound limb; on being released it immediately resumed the shortened position. Occasionally during such manipulations the head passed over a ridge at the position of the upper border of the acetabulum, but showed no disposition to maintain its proper position below this ridge in the spot where the normal socket should have been. The ridge was too slight to indicate a well-formed acetabulum.

Extension by adhesive straps and weight was at first applied, partly to accustom the muscles to their new position, partly to accustom the child to some degree of restraint. On June 12, under full anæsthesia, the thigh showed the

same tendency to displacement as without ether. It was found, however, that when the thigh was flexed and slightly abducted the head of the femur would retain the desired position.

The limb was then secured in this position by a plaster-of-Paris spica, carefully applied to so retain the limb as to prevent any possibility of subsequent displacement. The knee was flexed and the bandage extended below it. This position proved a comparatively comfortable one, or at least less irksome than might have been expected, as the child could lie on either side or on her back. She was allowed perfect freedom of motion in the bed.

On June 30th the plaster was carefully removed and the limb extended without the head slipping out of its proper position. A new plaster spica was applied with the limb extended.

The patient was, after a short time, allowed to be about on crutches, with a thick sole on the foot of the well leg, and on August 28th she was allowed to go home wearing the plaster splint, and walking on the right leg, with crutches. She returned at intervals for inspection and renewal of the plaster until the splint had been worn about six months, when it was finally removed. The patient was seen some months later, when the head of the femur was still retained in its proper place. There was some shortening, however, due to imperfect development in the head and neck of the bone, so that the trochanter on the affected side was higher than on the perfect side.

She was able at the time to walk without a noticeable limp; on quickening her pace to a run, however, the limp due to the shortened limb became perceptible.

The improvement was very marked, although restoration to an absolute equality with the unaffected side was impossible. The tendency of the imperfect head to escape from the imperfect acetabulum was most marked at the time the child was taken under treatment, but it was overcome in a comparatively short time. The plaster-of-Paris casing became exceedingly disagreeable during the very warm weather, and it was abandoned at the very earliest moment that was considered safe.

The position that was at first adopted is practically the position used by Dr. H. J. Bigelow to retain a traumatic dislocation which repeatedly slipped out. Dr. Bigelow's account reads as follows: "The patient was placed in bed on her back and the dislocation again reduced by flexion, abduction, and eversion, which brought the flexed thigh and knee down to the mattress on their outer side. The knee was then tied to the bedstead in this position by a towel, and the foot secured to the knee of the sound side until the socket should be excavated by absorption. In two weeks she was allowed to sit up, and in two weeks more was discharged well."[1]

Up to the present time no opportunity has come to me to repeat the procedure. It is, therefore, impossible to know how widely the method is applicable. The more nearly normal the acetabulum and the head of the femur, the better the opportunity for successful treatment. As the child grows, the head of the bone and the acetabulum, separated from each other and deprived of their natural functions, do not develop normally. The cotyloid cavity tends to become contracted and to assume an oval, or even a triangular, shape, approximating, as it were, to the primitive form. The head loses its spherical appearance and becomes changed in its dimensions and texture.[2] It would seem probable that treatment at as early a period as possible would offer greater chances of success than at a later period of childhood, when the head and socket have been greatly changed by the growth of the child.

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[1] The Hip, page 56.

[2] Carnochan on Congenital Dislocations of the Femur, pages 150–152.

DIPHTHERIA, SCARLET-FEVER, AND MEASLES.

A SUMMARY OF TWO THOUSAND CASES ADMITTED SINCE 1880.

By A. L. Mason, M.D.

On account of the insufficient provision for the isolation and treatment of contagious diseases (except small-pox) in Boston, the City Hospital has received a large and increasing number of such cases, the care of which has formed an important part of the general work. With the assistance of Dr. W. A. Morrison, House Physician, the following summary has been made. Admissions: —

	Measles.	Scarlet-Fever.	Diphtheria.
1880	25	10	95
1881	40	13	70
1882	6	19	69
1883	35	43	93
1884	9	87	157
1885	46	58	122
1886	20	66	154
1887	114	75	182
1888	71	79	330
Total	366	450	1,272

Of the diphtheria patients, upwards of four hundred and fifty were admitted for surgical treatment, and eighty-five more were transferred from the medical department for the same purpose. (See Surgical Summary, by Dr. Gay.) One hundred and sixty-five patients with contagious diseases were received from other hospitals, asylums, charitable institutions, and hotels; viz., scarlet-fever, eighty-seven cases; measles, forty-one cases; diphtheria, thirty-seven cases.

MEASLES.

Age. — Most of the patients admitted with measles were young persons or adults; few children, as they are generally taken care of at home, since the epidemics of this disease have not been of a severe type. Of three hundred and sixty-six patients, five died.

The ages at admission were as follows: Under five years, 36; between five and ten, 33; between ten and twenty, 89; between twenty and thirty, 188; between thirty and forty, 15; over forty, 5. The youngest patient was an infant of seven months; the oldest, a man of fifty-three years. Susceptibility seems greatly to diminish after thirty, and among adults there was a slight preponderance of females over males, about six to five.

Complications. — Ten cases had severe conjunctivitis; one, extensive sub-conjunctival effusion. Twenty-four patients had purulent otitis, which was the most tedious and troublesome complication. There were thirty-six cases of acute Bright's disease, of more or less severity, — ten per cent., rather a large proportion. Severe thoracic symptoms were not frequent. In one case there was pneumonia, with recovery in twenty-six days; in two, dangerous bronchitis, one fatal; in one, empyema, which caused death. One patient only, a young man of nineteen, died from acute Bright's disease, on the twelfth day. An infant of seven months and a young woman of twenty-four died after a week's illness from the severity of the initial fever. Two patients who entered with measles died on the twenty-second and fourteenth days, from intercurrent affections which developed after admission.

Skin. — The rash was petechial in one case only. In several it was confluent. The desquamation was furfuraceous, except in one case, when the skin peeled off in large patches. In another, measles had immediately followed scarlet-fever, and both desquamative processes went on simultaneously. A mother developed the rash one day after confinement. The nursing infant did not take the disease.

Duration. — Ninety-two cases were discharged as "well" within the first week; one hundred and eighty-four in the second, and forty-six in the third week; thirty-three more went before the thirtieth day; and eleven only, who were delayed by renal and aural inflammations, stayed for a longer time; several remaining fifty, and one, more than sixty days. Most of the cases entered during the early days of the eruption. The rate of mortality was low, and would probably have been higher if there had been more children.

SCARLET-FEVER.

Admissions. — Four hundred and fifty patients with scarlet-fever were admitted. Seventy came from other hospitals and institutions. The mortality was 8.5 per cent.

Age. — Half the cases were children under ten years; viz., under five, 99; between five and ten, 120; ten to twenty, 95; twenty to thirty, 115; thirty to forty, 20 cases; and one, fifty years old. There were nearly twice as many women as men; and of nine fatal cases in adults eight were females.

Kidneys. — Albuminuria was noted in ninety-one cases, one-fifth; and of these, fifty-one had severe Bright's disease in the acute form, which proved fatal in eight cases. This affection usually came on during convalescence; but in one-fourth of the cases it began in the first week, and sometimes at the very onset. It was more frequent in severe cases than in those of milder type. For forty-three cases which recovered, the average time in hospital was six and a half weeks; the longest, eleven weeks. No case was known to have become chronic. After the acute stage had subsided, patients were often allowed to go out of doors. The earliest death from this cause was on the fifth day after admission; the latest, on the forty-fifth day; four between the twentieth and thirtieth days.

Throat. — Five patients presented the anginose type of disease, with bad sore throat, glandular swelling, and septic poisoning. Three died.

But a much more frequent complication was a condition

which could not be distinguished from diphtheria. Either at entrance or in the early days the tonsils and fauces were covered with a dirty, gray, diphtheritic membrane, often foul in odor, and accompanied by nasal discharge and glandular swelling. There were forty such cases, of which seven were transferred to the surgical department for tracheotomy, and five others died. The rash in these cases had the typical appearance of scarlet-fever. Post-diphtheritic paralysis developed in several instances. This coincidence of diphtheria with scarlet-fever has often been observed in communities where both diseases have been prevalent, and seems to indicate that the state of the throat in scarlet-fever renders the patients particularly susceptible to diphtheria.

Ears. — Purulent otitis, involving the middle ear, was noted in twelve cases, of whom eleven made slow recoveries. Probably it occurred much oftener, but many such cases were transferred to the aural department, and the result as to the hearing is there recorded.

Joints. — Acute rheumatic arthritis was a painful complication in two cases.

Chest. — Several patients had pleurisy, one only developing empyema, which got well after operation, remaining seven weeks in hospital.

Skin. — Desquamation, which usually began about the seventh day, sometimes as early as the fourth and as late as the twelfth day, was generally completed in the third or fourth week, when the patients were discharged. But in twenty-eight cases this process went on, with repeated exfoliations, for more than six weeks; in one instance, sixty-five days. The charts of these cases show that the fever had entirely abated, and they were usually allowed to go out of doors. It is not probable that the later desquamations are active conveyers of the poison. Carbolized vaseline was thought useful, and scrubbing the palmar and plantar surfaces with solution of potash hastened the process.

Treatment. — The treatment was mainly symptomatic; cool and tepid sponging and antipyretic drugs, of late phenacetine, being used in many cases where the fever was a source of discomfort. In a few instances the temperature

rose above 105° F. Inunctions of oil or vaseline were found to allay the irritation of the skin, and sleep was promoted when necessary by opiates and other hypnotics. Amylen hydrate and sulphonal were given in doses of half a drachm to one drachm for the adult. The former sometimes causes slight intoxication, and sulphonal may be followed by languor and headache.

Acute nephritis was best treated by revulsives to the loins, hot-air baths, wet packs, and the milder diuretics, diaphoretics, and salines. About ten per cent. of the cases with Bright's disease died, two of them having severe convulsions.

Results. — The cases admitted were probably beyond the average in point of severity, especially those from certain institutions, one of which sent twenty, and another sixteen, cases within two years.

The number of deaths was thirty-eight, of which eight presented renal and eight throat complications. One-third of the fatal cases died within five days after entrance; viz., three on each of the first three days, two on the fourth, and two on the fifth.

Illustrative Cases. — I. A child of eleven months, the youngest admitted, died on the tenth day, with anginose symptoms, Bright's disease, and purulent otitis.

II. A girl of five years died in convulsions within twenty-four hours after admission.

III. A child of five died on the fourteenth day in convulsions, with suppurating glands in the neck and paralysis of deglutition.

IV. A child six years old, who had a slight rash, but severe throat symptoms, died on the thirty-second day, with convulsions from acute Bright's disease.

V. A child of two years had developed diphtheria on the third day. Diphtheritic conjunctivitis and sloughing of cornea followed. Paralysis of deglutition on the twentieth day. Death on the twenty-sixth day.

VI. A man, æt. 27, who had had general eczema fourteen years before, began to desquamate on the fifth day. This was followed by universal eczema, which lasted three months. Intense itching was most relieved by lead wash.

VII. A girl of fifteen, with confluent eruption, died on the second day in a state of stupor, with pulmonary congestion. Temp., 105°; pulse, 140.

VIII. A girl of nine developed diphtheria, Bright's disease, and acute rheumatic arthritis. She recovered.

IX. A boy of eighteen, who began to desquamate on the fifth day, came out with the characteristic eruption of measles on the same day. Both desquamations were noticed.

X. A boy of six had albumen the second day, and acute Bright's disease until the sixty-fifth day. Measles from sixtieth to seventieth day. Discharged well the eightieth day.

DIPHTHERIA.

Admissions. — Diphtheria of a very fatal type has prevailed for many years in Boston, and since 1884 has greatly taxed the resources of the hospital, as cases of this disease have not been received elsewhere. In 1887 one-sixth of all the cases reported to the Board of Health were treated in this institution; in 1888, when the new isolating ward was opened, one-fourth. Dr. J. H. McCollom, the city physician, whose valuable reports on this disease appeared in the "Boston Medical and Surgical Journal" for March, 1889, found that the general death-rate is about one-third of all reported cases. The mortality in the hospital has been very great, from 40 to 52 per cent. in different years, in spite of the fact that the new wards are as perfectly adapted as possible to the care of this class of cases, and the nursing by the members of the hospital training-school is equal to the most exacting requirements. Many patients are brought in moribund, as a last resort, for tracheotomy or intubation of the larynx, and of those admitted to the medical department the condition of many is so desperate that they die within a few hours, or days, after entrance. Few mild cases are seen.

In 1888, of one hundred and sixty cases treated surgically about one-fourth recovered; and of one hundred and sixty-five cases treated in the medical department forty-seven died, or 28 per cent. In 1887 the mortality in one hundred and

eighty-four cases, including tracheotomies, was 47 per cent.

In general, it may be stated that, of those patients who presented no respiratory complications, nearly one-fourth died; of those in whom the membranes extended to the larynx and trachea, rather more than one-fourth recovered.

Since 1880, eight hundred and twenty-two cases of diphtheria have come to the medical side of the hospital, and in the following analysis they will be considered in regard to causation; the relation of age, sex, and season to this disease; the complicating symptoms and sequels; treatment; the causes of death and post-mortem conditions.

Contagion. — Infection could be directly traced from previous cases in less than one-fourth of the patients admitted. Several often came from the same crowded tenement in which the origin of the first case was unknown. During these nine years thirty-seven cases were sent to us from other hospitals and institutions, sometimes in groups of three or four; but usually the prompt removal of the first case prevented the spread of the disease in those establishments. Nine cases came from hotels, and in no instance was the disease known to have been taken from, or transmitted to, another person. Six nurses entered, who had caught diphtheria from patients outside the hospital. They all recovered.

The influence of contagion could be more exactly traced among the hospital inmates. Of these, forty-one took diphtheria, — an average of about four per annum, viz., thirty nurses, eight male and twenty-two female, of whom two died. Four of the nurses had not been on duty in the diphtheria wards. Three employés, and six patients under treatment for other diseases, also had diphtheria.[1] Of the former, one was a laundry-maid, who may have caught it from the clothing; and another was the hospital undertaker, who developed severe constitutional diphtheria from pricking his finger while sewing up a body. A similar accident happened to a student of medicine.

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[1] More than 40,000 patients have been admitted during these years.

One of the house-surgeons poisoned his left fore-finger by using it as a guide to the epiglottis in performing intubation of the larynx. Purulent inflammation set in, with constitutional symptoms. Later, ataxic gait; absence of knee-jerks; partial paralysis of fingers and feet; slight regurgitation. Recovery in about two months.

Finally, two of the house physicians, in the faithful discharge of their duties, took this malady, one of them unfortunately falling a victim to his assiduous care of the patients committed to his charge.

Locality. — The effect of overcrowded and filthy sections of the city in propagating diphtheria does not seem to be so great as would be supposed. A considerable number of our cases came from the suburban, thinly-settled wards. Although the North End, where there is population of several hundred to the acre, with a large proportion of foreigners, contributes its full share of all contagious diseases, the returns of the Health Board show that Dorchester and Brighton have been, during the past year, equally infected by diphtheria. Two cases only were reported from the Back-Bay district. A focus of contagion having been established, the disease seems sometimes to spread in spite of good sanitary conditions, as the house-to-house inspection of the Board has shown; and their opinion is, that contagion, through mild cases in the schools, is the chief causative factor. This supposition is partially borne out by the fact that diphtheria is less prevalent during the weeks of vacation in summer.

Season. — The number of admissions to the hospital by months for the past nine years has been as follows: —

In January, 72; February, 74; March, 57; April, 48; May, 86; June, 68; July, 57; August, 38; September, 56; October, 62; November, 89; December, 115.

Or, in the winter months there were 261 admissions; in spring, 191; in summer, 163; in autumn, 207. Statistics from Paris by Besnier, and from other cities where diphtheria has prevailed most extensively, show that this disease reaches its greatest intensity in the cold weather of winter. Such is the experience of our State Board of Health.

Age. — The susceptibility in childhood is shown by the fact that of these 822 patients, 440 were less than ten years old; viz., 9 under one year; 233 between one and five; and 198 between five and ten. Of the others, 165 were between ten and twenty, 83 of these being under fifteen; 161 were between twenty and thirty; 40 between thirty and forty; and 16 between forty and fifty. From the age of ten to thirty there appears to be an almost equal susceptibility to diphtheria, not very great as compared with the earlier years of childhood, but considerably greater than after thirty, when the danger becomes relatively slight. The number of admissions, the danger of croup, and the rate of mortality were notably less after the sixth year.

Sex. — After the age of fifteen, nearly three-fourths of the admissions were females.

Well-authenticated second attacks were few; viz., one patient after twenty years, and one nurse after seven years. Another nurse had had two previous attacks.

Recurrent membranes appeared in one case five days after they had gone from the tonsils, which in the meantime were red and swollen.

Mortality. — Eighty-eight patients who were admitted to the medical department were subsequently transferred for surgical treatment on account of laryngeal obstruction. Croup in these cases was always of diphtheritic origin. If these were included, the death-rate would be much higher, but their record will be found in the surgical summary.

Among the remaining seven hundred and thirty-four cases treated medically, one hundred and seventy-seven were fatal, or 24 per cent. The following table will show the number of admissions during each year of childhood up to the tenth; also the number of deaths, besides the cases transferred for croup, seventy-nine in number, among whom the deaths are not here included: —

Age.	Admissions.	Deaths.	Croup.
Under 1	9	4	1
1	82	23	15
2	43	15	10
3	41	15	11
4	56	22	7
5	64	17	18
6	43	14	6
7	30	8	1
8	30	6	3
9	23	6	2
Not recorded	19	7	5
	440	137	79

Seven deaths resulted from croup, for the relief of which no operation was thought advisable. From these figures we see that laryngeal obstruction took place in about one-fourth of the cases up to the sixth year of life, diminishing to one-seventh in the seventh year, and to one-tenth or less, later. Besides the deaths from this cause, the mortality during the first six years of life varied in different years from one-third to one-half among children whose breathing was free.

The grave and often hopeless nature of the cases when they presented themselves may be inferred from the rapid downward course which the disease ran in the majority of fatal cases. Thus, of the one hundred and seventy-seven cases which resulted fatally, exclusive of those transferred for croup, one hundred and six died within the first four days, and one hundred and thirty-five within a week after admission, viz. : —

Deaths on the first day after admission	34
Deaths on the second day after admission	22
Deaths on the third day after admission	25
Deaths on the fourth day after admission	25
Deaths on the fifth day after admission	10
Deaths on the sixth day after admission	9
Deaths on the seventh day after admission	10
	135

Twenty-six died in the second week, ten in the third, and six in the fourth week after entrance.

Under one year of age there were nine patients only. One, eleven months old, was transferred for surgical treatment. Four died, the youngest being twenty days old; two, eight months, and one, nine months.

More children in their second year were admitted than in any other, viz., eighty-two. The proportion of deaths at this age, however, was rather less than for the four years following.

Between the ages of five and ten, only twelve cases of laryngeal obstruction developed in one hundred and twenty-six patients. The mortality from other causes was 30 per cent.

Beyond the age of ten, complications were fewer, and the patients were more amenable to treatment. Of three hundred and eighty-two cases, or nearly half the number admitted, nine came to tracheotomy or intubation, — about one in forty; and only one in sixty of those who were more than fifteen years old.

There were forty deaths only of patients more than ten years old, — about ten per cent.

Age.	Admissions.	Deaths.
Between 10 and 20 . . .	165	14
" 20 " 30 . . .	161	18
" 30 " 40 . . .	40	6
" 40 " 50 . . .	16	2
	382	40

Children between ten and fifteen seem to be no more susceptible than older persons. Eighty-three entered who were between these years, and eighty-two between fifteen and twenty, eight of the former series dying and six of the latter; while there were one hundred and sixty-one patients between twenty and thirty, of whom eighteen died.

SYMPTOMS AND SEQUELS.

Local. — Ninety-one fatal cases were characterized by external cervical swelling, often extreme, with suppuration;

by sloughing membranes and foul nasal discharge, — conditions which caused septicæmia and rapid exhaustion.

Many septic cases, however, recovered, and in twenty-eight of this class there was a considerable offensive nasal discharge, always regarded as dangerous, from the larger extent of freely absorbing mucous membrane involved. Few cases did badly in which the membranes did not extend beyond the immediate vicinity of the tonsils.

Pulmonary. — Lobar pneumonia, and bronchitis extending to the smaller tubes, were noted during life in two cases each, and no instance of recovery from these complications is recorded. Deglutition pneumonia was probably present in several cases, and was verified by a few post-mortems. But most of the patients in whom the inflammation extended downward were transferred to the surgical department for operation.

Convulsions. — Convulsions were infrequent, but they occurred in four fatal cases, — two nursing infants, one child two and a half, and another four years old; also in two patients who recovered, — a child of two years, and a woman in the sixth month of pregnancy, who had albuminuria. She was taken with epiliptiform convulsions in the second week of diphtheria; but there was no miscarriage, and she got entirely well. Pregnancy was observed in no other case in this whole series.

Coincident epilepsy occurred in one other female, and in the following case the origin of the symptoms was doubtful: —

A robust trained nurse, thirty years old, after taking care of a bad case of diphtheria in a family for a week, suddenly fell to the floor unconscious. She had not complained of her throat, but she was immediately brought to the hospital, and found to have a diphtheritic patch on one tonsil, which extended later to the other tonsil and the uvula. Consciousness was soon regained, but for several days there was no memory of previous occurrences, and no appreciation of her condition. There was no paralysis. The pupils were dilated. The peculiar mental state passed away, and recovery was complete in three weeks. She stated that she had had fits in childhood, but not for a great many years.

Delirium. — Delirium was a prominent symptom in a few fatal cases.

Bright's Disease. — Albuminuria was present in a large proportion of the cases, and acute Bright's disease of severe type occurred in twenty-eight patients, or about 4 per cent., of whom seventeen recovered and eleven died.

Local Inflammations. — Hemorrhages from nose and mouth caused fatal exhaustion in one case. Inflammation of the middle ear required special treatment for perforation of the drum in twelve cases, of whom ten were discharged well.

Phlebitis of the leg occurred in one instance. Diarrhœa was a serious symptom, but not frequent. Tonsillar and glandular abscesses were not rare.

Skin. — Marked eruptions were noted in eight cases, — of scarlet color in five, deep red and papular in three. Herpes of the lips and face was seldom seen.

Vomiting. Heart Failure. — Persistent vomiting, with pallor and feeble pulse, was a very bad symptom, usually denoting affection of the pneumogastric nerve, and accompanying heart failure or paralysis. Few cases recovered in which this vomiting continued. Sudden paralysis of the heart caused death in five cases, and there was a more gradual failure of this organ in fifteen others, usually after the membranes had disappeared, and often preceded by throat paralysis, but not always.

The following cases will illustrate the course of these symptoms : —

Case I. — A girl fourteen years old, who had been sick a week, entered with tonsils, uvula, and palate covered by a dirty, grayish membrane. Odor foul ; speech difficult ; great glandular enlargement at angles of jaws ; no nasal discharge. There was bronchitis, and the urine showed albumen and fine granular and hyaline casts.

The throat was cleansed every two hours with Dobell's solution, and tincture of the chloride of iron was applied, as well as administered internally. Brandy was given freely, and tincture of digitalis, four minims every four hours for five days.

On the eighth day there was no fever ; the pulse was good,

and no membrane remained. Improvement continued for five days, when she began to look pale, and the pulse was found to be weak, though not rapid, 70 to 80. On the morning of the fifteenth day she vomited, but seemed pretty comfortable until afternoon, when she became semi-conscious, very restless, with dilated pupils and imperceptible pulse. There was no response to stimulation, and she died in three hours from heart clot.

Case II. — A young man of seventeen, who had been ill five days, came in with greatly swollen neck and tongue which was protruded. The whole pharynx and tonsils were covered with a foul, dirty, gray membrane. There was a bloody discharge from the nose. The odor was very offensive. In spite of these conditions there was not yet much systemic poisoning. The temperature was 99.8° F.; pulse, 60; respiration, 25; urine, normal.

Vigorous disinfecting and stimulating measures were adopted, and the throat became clear in ten days, the membrane being thrown off in large pieces. On the eleventh day the patient presented no bad symptoms except a weak pulse, which, two days later, had become very slow, 40 to 50. A large quantity of nourishment was taken and a pint or more of brandy daily, together with digitalis, quinine, caffeine, and strychnine; but with no avail in combating the cardiac paralysis. Vomiting began on the seventeenth day, when it was noted that there were three or four beats of the heart at the apex to one impulse at the wrist; pulse, 50; cyanosis.

On the twenty-first day the patient refused nourishment on account of the constant vomiting, became delirious, and the pulse rose to 120. For three days more he was sustained by enemata, which were finally rejected. He became pulseless, and died gradually of heart failure on the twenty-fourth day after admission, nearly two weeks after all membranes had disappeared. There was no other paralysis.

Case III. — A man twenty-three years old came in with extensive membranes; neck much swollen and hard; nasal discharge. After two weeks the throat became clear. Purulent otitis of both ears ensued, and there was paralysis of the muscles of deglutition. After lingering two weeks, par-

tially cyanosed, with a fluttering heart, death ensued as in the previous case.

Remarks. — During convalescence a pallid complexion and feeble pulse call for all possible endeavors to strengthen the heart and to enforce a recumbent position. But when all is done, all precautions taken, and all forms of cardiac and nervous stimulants administered, supplemented perhaps by the electric battery, most cases which develop heart failure die, either gradually or suddenly. The clinical symptoms indicate a paralysis of the functions of the pneumogastric nerve, chiefly in its gastric and cardiac branches. A primary heart clot, or a parenchymatous degeneration of the cardiac muscle alone, similar to that which occurs in typhoid, does not explain the symptoms. The voice may be suppressed and the respiration impeded. The varying periods after which death follows the onset of these attacks cause differences in the appearance of the clots. Simple cardiac degeneration is more amenable to treatment than the paralysis of diphtheritic origin.

Paralyses. — Inability to swallow, with regurgitation through the nose, occurred in six cases which were fatal, and fourteen which recovered. This complication affected five patients in the first week, and three of these died. Fifty-five days was the longest time required for recovery. Paraplegia occurred in one fatal case. Extremities were paralyzed in a few instances. Other cases may have occurred after leaving the hospital.

Sometimes the course was very tedious, as the following cases show : —

Case I. — A school-boy, seven years old, had a severe attack, with extensive membranes and nasal discharge. After ten days the throat was clear, but the pulse was weak, the skin cold, and vomiting began. Signs of heart failure were treated by rectal enemata, digitalis, and brandy. On the fourteenth day there was regurgitation through the nose and vomiting. Four days later the patient suddenly became pulseless, white, and cold, but was revived by subcutaneous injections of brandy and enemata. By the twenty-second

day the heart had gained strength, but paralysis of the legs and of articulation ensued and lasted one month.

At the end of the second month the heart again became rapid and irregular, with a systolic murmur, and sibilant and moist rales were heard throughout the chest. Dyspnœa was urgent. Paralysis of respiration was feared; but after the free use of stimulants, digitalis, and nux vomica the patient rallied. The voice remained very indistinct, and there was no power in the legs. These symptoms lasted another month, and the patient was not convalescent before the eleventh week.

Remarks. — In this case the paralysis affected several sets of muscles, and was complicated by heart failure. On two or three occasions the patient would probably have died if he had been out of reach of the promptest measures for relief.

Case II. — A girl four years old, after a severe septic attack with glandular abscess and purulent otitis, developed in the fourth week complete paralysis of the deglutition muscles, with feeble heart and marked impairment of the respiratory function. The breathing became very slow, eight to the minute; the pupils were contracted, face pale, condition torpid. Swallowing became impossible, and food went into the trachea. There were abundant mucous rales in the chest. In the feeble condition of the patient exhaustion seemed imminent.

Nutritive enemata were not long tolerated; but by means of the soft catheter passed into the stomach through the nares the child was fed for nearly four weeks, and made a good recovery. She did not speak at all, and could not cry aloud during this period, but as the paralysis improved she began to cry with vigor.

Remarks. — The impairment of the pneumogastric functions regulating the heart, stomach, respiration, and voice was very noticeable in this as in the previous case, and a sufficient explanation would seem to be the proximity of the vagus to the mass of infiltrated and infected tissue.

The existence of a neuritis in all such cases seems probable. The hypoglossal and glossopharyngeal nerves may also be involved.

Pathological Appearances. — There were thirty autopsies. Beside the diphtheritic inflammation of tonsils, palate, glottis, epiglottis, and trachea, sometimes causing occlusion, in the septic cases signs of systemic poisoning were noticed in the enlarged spleen, which was doubled in size in six instances. Cloudy swelling of the liver and kidneys was often found. Hyperplasia of the lymph glands of bronchi and mesentery and of the intestinal lymph follicles was a frequent appearance. Of cases involving the air passages, in some of which tracheotomy had been performed, the lungs were found œdematous in two; lobar pneumonia was observed twice; capillary bronchitis, with broncho-pneumonia, eight times; and the direct extension of the fibrino-purulent process to the smaller bronchi six times. There were four cases of atelectasis and interstitial emphysema in circumscribed portions of the lungs. Fibrinous pleurisy occurred three times. Venous engorgement of all the organs was often noted.

Heart. — The heart was usually firmly contracted and the left ventricle empty. Fibrinous coagula filled the right auricle and ventricle in two cases, and in one these chambers were distended by soft clots.

One case showed paralysis of the left ventricle, which was distended to three times its size by dark coagula, and was globular in shape, the muscle being pale and opaque. This patient had died in the fourth week, apparently from cardiac paralysis and muscular degeneration combined.

The general desire for early burial and the wishes of parents prevented more autopsies.

Treatment. — These patients have been under the care of all the physicians of the staff, and in a brief reference to the treatment of diphtheria it may be said that nearly all the agents recommended for general and specific purposes and for disinfection have been tried, with success in many cases, but with no impression upon the most malignant type of disease. There is no preventive for laryngeal complications, although an atmosphere containing much steam is sometimes of service in ameliorating the distressing dyspnœa. An appliance for supplying steam is at the head of every bed. After septic symptoms have developed, no specific remedy

thus far discovered is an antidote. Sulphur, sulpho-carbolates, salicylic acid and salicylates, — latterly corrosive sublimate in as large doses as could safely be administered, — and many other remedies have had more or less extensive trial; but, so far as destroying or neutralizing the blood-poison is concerned, all are without effect.

The most assiduous nursing, day and night; systematic feeding by mouth, rectum, and stomach-tube, as occasion has required; early and very free alcoholic stimulation, and thorough cleansing and disinfection of the throat and nares, — have been the means of saving many lives.

When dysphagia is troublesome during the early days, owing to extreme soreness of the throat, nutritive enemata are of value in preventing debility, chiefly in adults. With young children the rectum may not tolerate injections, especially if they contain brandy.

Paralysis of the throat generally requires the use of the stomach-tube to prevent the passage of food into the bronchi, and the resulting "deglutition pneumonia." Intubation of the larynx is said to be open to the same danger.

Stimulation should often be carried to an extreme degree, and is of very great benefit; but cases of heart failure may develop and go on to a fatal result entirely unaffected by the constant use of large quantities of brandy, digitalis, and other cardiac stimulants. There may be no response whatever to these agents, and the symptomatic vomiting may make them worse than useless.

The internal use of iron, in the form of the tincture of the chloride, has been pretty general. Pilocarpine combined with whiskey was tried for a time, on account of its supposed effect in loosening the membranes. Chlorate of potash in various combinations proved serviceable, both internally and locally.

The free use of opiates for pain, and of amylen hydrate, sulphonal, and other hypnotics, was the usual practice. Strychnine and massage have appeared to be of some value in cases of paralysis.

Locally, great care has been taken in all cases to cleanse the throat and nose as thoroughly as possible. In young

children the exhaustion from struggling may more than equal the benefit derived. Gargles, douches, and sprays in great variety have been tried; carbolized fluids, solutions of corrosive sublimate, sulphurous and lactic acids, iodoform, compound tincture of benzoin, lime-water, and various substances for which solvent powers have been claimed. While many of these agents have been of great use in diminishing the dangers of septic absorption, destruction of the specific germs is unaccomplished, and the tendency has been toward the use of the milder and less painful applications. In the less severe cases a spray of lime-water has some effect in detaching the membranes. In the worst cases nothing does it but force, and then they return. Ice-bags, ice-collars, and poultices sometimes have a soothing influence when the glands are painful, and applications of cocaine are occasionally of service for dysphagia.

Acute Follicular Tonsillitis. — This affection, which is largely prevalent at the season when diphtheria is most active, not infrequently presents itself in the hospital, occasionally in the diphtheria wards, through error of diagnosis. The severity of the onset, with chills, headache, and high fever, pains in the limbs, and constitutional disturbance, is often greater than in cases of diphtheria, which is more insidious. Discrimination is not always easy when the follicular patches on the tonsil coalesce; but the fact that this secretion can be removed, and does not appear on the uvula or adjacent parts, generally leads to a correct opinion. Several cases may present themselves in the same family; but there is little reason to think that this disease is caused by the diphtheritic poison, as has been stated. The recognition of a specific microörganism, or its absence, in such cases would be an important aid to diagnosis.

Conclusion. — The foregoing summary may serve to indicate in a general way the character of these diseases as they have prevailed during nine years past, and the extent to which the hospital has proved a refuge for a class of patients not otherwise provided for. The isolating wards have reduced the danger of contagion within the premises.

NOTES ON INFANT FEEDING.

By T. M. Rotch, M.D.

It has so happened during the past three or four years that I have met with a number of cases connected with the subject of infant feeding, which, being under my complete control in the hospital could be investigated with unusual precision. The notes on these cases, and the deductions made from them, may be of some practical importance to the general practitioner, and I have, therefore, embodied them in this article with some cases of the same class which have come under my observation in private practice, and such general remarks as are necessary to elucidate the subject.

The breast milk at times is found to cause such serious symptoms of indigestion in the infant that a change to artificial food seems almost a necessity. There is no doubt, however, that in many instances the infant is weaned for insufficient reasons, and that a more extended knowledge of the conditions which influence the breast milk as a food will enable us to manage this class of cases more intelligently.

The direct analysis of the milk, as a means for determining the especial ingredient of the food which is causing indigestion in the infant, is something which is being made more and more use of, and will in the future aid us very materially. Even now, although the knowledge which we have derived from this source is still very imperfect, we can make certain deductions from the figures which are presented to us which will often prove of a good deal of practical importance in helping to determine the various questions which arise regarding the feeding. Among the difficulties which have so far been found, the greatest in obtaining correct information from the analyses of human milk are, that the proper percentages of the different ingredients of

the ash have not been reliably determined, as they have in cow's milk; also that the anlayses as usually made represent only a partial information as to the proportion of total solids and water which the stomach of the infant contains at the end, not only of the nursings as a whole, but of each individual nursing. Thus this proportion of the total solids to the water differs so materially, according as the milk drawn for analysis is taken before the breast has been nursed, or just at the end of the nursing, that the resulting analysis, though it may be correct chemically, may be very misleading clinically, as will be best understood by referring to the following figures, which present examinations of the fore milk, middle milk, and strippings.

Analysis I.

Cow's Milk. (*Harrington.*) [1]

	Total Solids.	Water.
"Fore milk"	13.34	86.66
"Middle milk"	15.40	84.60
"Strippings"	17.13	82.87

The analogy between the mechanism of the mammary glands in animals and human beings is so close that the reasoning which will hold true for one can, in most cases, safely be used for the other.

We thus see that where an analysis is made simply of the fore milk, which is almost always the case in woman's milk, we might be seriously mistaken in supposing the total solids to be much lower in their percentage than was actually the case, and thus again be led to suppose that dyspeptic symptoms had been caused by a much lower percentage of total solids than in reality was contained in the entire quantity of the milk taken. We must then recognize, as practical physicians, that we should not rely merely on the opinion of the chemist, who gives us his figures of an especial analysis, and, as is the custom, states "This is a good or poor milk." The chemist cannot tell us whether the milk is good or bad

[1] Eighth Annual Report, Mass. State Board of Health, 1884, p. 189.

for the especial infant that we have charge of, nor can he tell us the various influences which may temporarily be making a good milk appear poor or the reverse. The answers to these questions should be made by the physician himself, who should take the chemist's figures and interpret them according to the varied circumstances of the case. In order that the physician should be able to do this intelligently, he must make use of all the physiological knowledge of the mammary gland, its function and its secretion, which we possess, and it may, perhaps, be well to review this knowledge for the purpose of understanding better what will be said later.

Bunge's [1] investigations on the comparison of tissues show that the mammary gland abstracts from the blood just about the amount of salts found in the tissues. According to Foster,[2] "milk is the result of the activity of certain protoplasmic cells forming the epithelium of the mammary gland. So far as we know, the fat is formed in the cell through a metabolism of the protoplasm.

"Microscopically the fat can be seen to be gathered in the epithelium cell in the same way as in a fat cell of the adipose tissue, and to be discharged into the channels of the gland either by a breaking up of the cells or by a contractile extrusion very similar to that which takes place when an amœba ejects its digested food.

"This observation is thoroughly supported by other facts. Thus, the quantity of fat present in the milk is largely and directly increased by proteid food; but not increased, on the contrary diminished, by fatty food. In fact, proteid food increases, and fatty food diminishes, the metabolism of the body. A bitch fed on meat for a given period gave off more fat in her milk than she could possibly have taken in her food, and that, too, while she was gaining in weight, so that she could not have supplied the mammary gland with fat at the expense of fat previously existing in her body. We also have evidence that the casein is, like the fat, formed in the gland itself. When milk is kept at 35° C. outside

[1] Archiv für Physiologie, 1886, 539.

[2] Physiology, page 564.

of the body the casein is increased at the expense of the albumen.

"When the action of the cell is imperfect, as at the beginning and end of lactation, the albumen is in excess of the casein; but, so long as the cell possesses its proper activity, the formation of casein becomes prominent.

"That the milk sugar is also formed in and by the protoplasm of the cell is indicated by the fact the sugar is not dependent on a carbohydrate food, and is maintained in abundance in the milk of carnivora, when these are fed exclusively on meat, as free as possible from any kind of sugar or glycogen. We thus have evidence in the mammary gland of the formation, by the direct metabolic activity of the secreting cell, of the representatives of the three great classes of food stuffs, proteids, fats, and carbohydrates, out of the comprehensive substance protoplasm."

Reasoning again from the strong analogy which must exist between human milk and cow's milk, and being aware of the great variations which occur in the latter, we may assume that human milk is liable to vary in its composition considerably with different milkings on the same day, and also with the milking of the same hours on different days; so that we at present are not in a position to state that our knowledge of human milk is sufficiently exact to justify an attempt to formulate a table to show the composition of woman's milk at different ages, however valuable such information may in the future prove to be. It is hardly within the scope of this article to discuss minutely the physiological question of the elimination of various elements by the mammary gland. The fact that such elimination does, however, take place is conceded, and at times becomes of a good deal of importance in the management of the infant's diet. In the early days of the milk secretion we find a decided difference in the character of its composition.

From our knowledge of the colostrum period of cows, it would seem from analogy that the mammary gland in the first five or six days is in part at least an organ by which transudation from the blood can take place; that is, that the colostrum period is one where the mammary gland has not

yet reached the perfect development of its function for producing milk from its own cells, and that the milk of this early period is very deficient in casein and proportionately rich in albumen. Under these conditions, and also where, as at times is the case, the milk is abnormal from some defect in the health of the mother, causing the colostrum period to be prolonged or to recur, there seems to be a direct transudation from the blood of such inorganic elements as arsenic, antimony, lead, iodide of potash, mercury, and others, taken by the mother.

Well-authenticated cases also come to our notice from time to time, where injury has been done to the nursing infant in this way, and where even death has occurred from the elimination by the breast milk of certain organic elements such as colchicum and morphia.

We must also recognize the clinical fact that it is not merely when the milk is in a poor condition that this elimination takes place, but that it may occur at any time during the nursing period in the breasts of women who, so far as we can ascertain, are in a perfect healthy condition.

Thus, every practitioner has at times doubtless observed the laxative effect on the infant of such drugs as the compound liquorice powder given to the mother, and a case has lately come to my notice where a baby vomited for weeks while taking the milk from the breast of its mother, who was unusually strong and well, but who was in the habit of drinking a considerable daily quantity of porter, and where the vomiting ceased at once and did not return on the porter being omitted. That both the secretion and character of the milk are strongly influenced by the nervous system is a matter of common clinical experience, but the exact nervous mechanism which controls it has not yet been fully worked out; the clinical result, however, is recognized that emotional mothers do not make good nurses. The physiological facts concerning the changes which take place, according to the variations from the normal (that is, according to the age) intervals of nursing, have an important bearing on the clinical management of the food. Thus, it is now well known that irregularity in nursing, too frequent nursing, and too pro-

longed intervals often so disturb the quality of the human breast milk as to transform a perfectly good milk into one entirely unfitted for the infants' powers of digestion. Thus, too frequent nursing lessens the water, and increases the total solids, in human milk, making it resemble in a certain way condensed milk. This condition I have met with a number of times, and, as an illustration of its clinical significance, I would mention the case of a young primipara, healthy, vigorous, and with an abundant supply of breast milk, who, under the advice of a physician, weaned her infant in two or three weeks, because there were certain dyspeptic symptoms, at no time, however, of a serious nature. In this case it was afterwards ascertained that the infant had been nursed almost continuously day and night, the mammary gland having its function called upon with such frequent and abnormal intervals as to evidently have reduced the water in its secretion to a minimum, and raised the total solids to such a degree that the infant was much more comfortable with its properly prepared artificial food. There is not much doubt but that the milk in this case, if it had been properly managed, would have agreed perfectly with the infant. On the other hand, too prolonged intervals result in such a decrease of the total solids as to render an otherwise good milk too watery and unfit for purposes of nutrition, however well it may be digested, as shown in the noted instance occurring in the summer of 1888, under my care in Ward G, where a multipara had been nursing up to the time of entrance her infant, which was thriving. This patient stated that her milk had always been abundant and of good color up to the time of entering the hospital, when she was separated from her infant. At the end of twelve hours the breast was found to be so distended that the breast-pump had to be applied. The milk was drawn with great ease, almost flowing of itself, and in considerable quantity, but it no longer resembled the milk of the previous nursing, which had been at the proper interval; on the contrary, it was clear, with very little color. The total solids were evidently reduced to a minimum, and it no longer would have nourished the infant.

The following analyses, which will now be better appre-

ciated after what has been written above, show not only the increase of total solids at the end of a nursing, but also that this increase is mostly of the fat and, to a lesser degree, of the albuminoids; they also show the difference resulting from longer or shorter intervals. Heidenhain explains this physiological phenomenon by saying that his investigations point towards the fact that during the pauses between the milkings the cells of the glands are growing, and a proportionately small amount of solids and large amount of water are secreted, while the irritation of milking causes increased activity of the milk cells, with a corresponding increase in the solid secretion and lessening of the water.

ANALYSIS II.

Ass's Milk. (*Peligot.*)

	1st Portion.	2d Portion.	3d Portion.
Butter	0.96	1.02	1.52
Milk sugar	6.50	6.48	6.50
Casein	1.76	1.95	2.95

ANALYSIS III.

Ass's Milk. (*Peligot.*)

	Milking Intervals: 1½ Hours.	6 Hours.	24 Hours.
Butter	1.55	1.40	1.23
Milk sugar	6.65	6.40	6.33
Casein	3.46	1.55	1.01

ANALYSIS IV.

Cow's Milk. (*Reiset.*)

Time since last milking.	Percentage of Solids at Beginning.	End.
12 hours	9.33	16.04
6 hours	12.80	16.06
2½ hours	12.84	13.08

ANALYSIS V.

Woman's Milk. (*Harrington.*)

	"Strippings," 2 Hours' Interval.	"Fore Milk," 12 Hours' Interval.
Total solids	15.32	10.14
Water	84.68	89.86
	100.00	100.00

With these chemical and physiological facts before us we are, while recognizing the great clinical value of human-milk analyses, forced to acknowledge that we must be most circumspect in the conclusions which we are authorized to deduce from such analyses of human milk as up to the present time have been made.

We can also assume that an error in these conclusions, where a correct chemical analysis has been made, is less likely to occur from the sugar and ash than from the albuminoids and fat, and most likely of all, in both frequency and degree, in the latter. It may be further said, regarding the clinical value of milk analyses, that the mere microscopic examination of milk beyond the determination of the presence or absence of colostrum-corpuscles is too uncertain and misleading to be in any way depended on, the chemical analysis being the only practical method which can be recommended. As an instance of the truth of this statement I can cite the case of a physician skilled in the use of the microscope, who sent me from a neighboring town a specimen of woman's milk which he said was rich in fat. The microscope seemed to corroborate this opinion; but a chemical analysis by Dr. Harrington showed that the specimen contained only a little over one and a half per cent. of this ingredient. The presence of an undue amount of yellow coloring matter is also at times very misleading. Among a number of cases which I might speak of as instances of a desire to wean with insufficient cause, the following, of considerable interest, came to me in consultation early in July, 1888, and points towards the possibility of our, at times, being too hasty in our decision to deprive an infant of its mother's milk.

The mother, a rather delicate primipara, twenty-five years of age, was delivered, July 3d, of a boy seven pounds in weight. Within four hours puerperal convulsions set in, from which she recovered, but was left with albuminuria 0.25 per cent. and casts.

The latter disappeared in a few days; but the albumen, though somewhat diminished, continued, and the patient, though naturally of a calm disposition, was in a highly nervous condition, fearing that she could not nurse her infant,

and being decidedly opposed to having a wet-nurse. The milk appeared in considerable quantity on the fifth day; but the baby did not thrive, and, although it gained somewhat in weight, was very fretful, slept very little, and looked badly, so that the attending physician became alarmed about it, and after treating it for its dyspepsia without much success, until it was five weeks old, and finding that there was still about 0.25 per cent. albumen in the mother's urine, decided with me that the breast milk should be withheld until we could determine the cause of the trouble, and an analysis was accordingly made, with the following result: —

Analysis VI.

Fat	1.62
Sugar	6.10
Ash	0.17
Albuminoids	3.54
Total solids	11.43
Water	88.57
	100.00

This analysis revealing the probability that the large amount of albuminoids were causing the disturbance of digestion, and the small amount of fat was not sufficient for nutrition, the attending physician was very anxious to procure a wet-nurse; but while we were endeavoring to get a proper one we decided to empty the mother's breasts with the breast-pump[1] every day, thus relieving her from the worry of attempting to nurse her baby, and of seeing it fail to gain, and thus also giving her undisturbed nights, and a great deal of out-door life.

[1] During the past summer, June, July, and August, I had under my care a baby seven months old, who was dying of starvation, as I had been entirely unable to prepare for it an artificial food which it could digest and thrive on. This infant was also totally unable to nurse from the breast; but the breast milk of a wet-nurse that I procured for it agreed with it perfectly, and this nurse pumped the milk from her breasts and fed the infant with it from a bottle for over three months, with the greatest success, the infant thriving and now being in such a healthy condition that it is about to be weaned. This case shows the exceptional, but at times very great, value of the breast-pump.

The infant was, in the meantime, placed on an artificial food, which was digested very well; and as the infant ceased to cry, the mother became tranquil, and the albumen in her urine in a few days was reduced to a trace. This treatment was carried out for a week, the milk continuing to flow freely, and an analysis was then made of the mother's milk, and also of a healthy wet-nurse, whose own baby was thriving on her milk, and the following results were obtained: —

Analysis VII.

	Mother.	Wet-Nurse.
Fat	3.20	3.04
Sugar	6.40	6.60
Ash	0.18	0.12
Albuminoids	2.52	2.32
Total solids	12.30	12.08
Water	87.70	87.92
	100.00	100.00

The two milks being equally good, it was then decided to allow the infant to begin to take one nursing daily from its mother, although the albuminoids were still about one per cent. higher than the infant was likely to digest; it was consequently given to its mother, nursed well, seemed satisfied, digested its meal without trouble, and at six months is still being nursed, and is healthy and well-developed.

However great may be the variation in the composition of animals' milk, and from our extended knowledge of the chemistry of cow's milk we know that this variation is a marked one, we must bear in mind that a far greater variation probably occurs in human milk. The physiological influence of the emotions on the nervous system, with its resulting changes in the mammary secretion, necessarily has a much wider range in the woman, subjected as she is to the worries and vicissitudes of civilized life, than in the animal carefully stabled and pastured. This variation in a mother's milk must be seriously considered, and the individual milk, rather than the general superiority of mothers' milk, investi-

gated in each case, if our feeding is to be successful. Instances not infrequently arise where such continual shocks are brought to bear upon the mother in her daily life, or where her own temperament is such an undisciplined one, that her milk, ordinarily good, becomes totally unfitted for her infant, and at times acts as a direct poison, with most disastrous results; so that the welfare of the infant in such cases unquestionably demands the change to a wet-nurse.

A nursing mother should be made to understand that these variations are liable to arise, however good her general health may be, and that while she is simply fulfilling a duty demanded by nature from those who bear children, in nursing her infant in the early months of life, her duty when once she has undertaken to nurse is to avoid as much as possible these variations, by regulating her life to a normal standard and avoiding excitement. Both of these requisites of a normal lactation come within the province of the physician to explain, as he would any other branch of rational medicine; for many a mother, by her course of life, is rendering her milk unfit for the proper alimentation of her infant, through ignorance of what seems to the physician but the simple dictates of common-sense, and she will be only too thankful for advice on this subject. Instances of this kind arise where, as observed by Zukowski,[1] seasons of fasting, with their accompanying excitement of the emotions, have induced such an influence on the milk, the fat especially being decreased to less than one per cent., that many of the nursing infants became sick and gave evidence of imperfect nutrition.

The question is often asked as to the variation in the milk which takes place from natural causes, such as the return of menstruation. Does such a return necessarily contraindicate the continuation of nursing? As in all questions of this kind, we cannot adopt and follow an inflexible rule, but we must be guided by what seems best for the individual case. Infants are at all times affected so seriously by the alteration in the constituents of the milk which is taking place once in

[1] Intestinal Diseases, Jacobi.

four weeks, that their nutrition is markedly interfered with, and a change to a more stable food is indicated. Again: the only disturbance which may arise is a temporary and slight digestive attack for a day or two, which apparently does not materially affect the infant, and makes us hesitate to run the risk of depriving the infant of a food on which it thrives during twenty-six days out of twenty-eight. We must also not be too hasty in concluding from the bad symptoms in the infant that we should at once withdraw it permanently from the breast, for the catamenia may appear once, and then not again for a number of months, the infant's powers of digestion in the meantime becoming so much more fully developed that they are unaffected by the catamenial milk; and again, even where the catamenia recur regularly, the disturbance which may have been marked at one period may, from many reasons, fail to recur at the next; so that the question is reduced to whether the composition of the milk shows a recovery of the equilibrium of its constituents within a few days, or remains affected to such a degree as to endanger the integrity of the infant's nutrition.

My own experience, so far as it goes, is in favor of allowing the infant to continue with the breast, unless it is decidedly contraindicated by circumstances such as have just been spoken of. I have seldom met with cases which could not without permanent injury be tided over the small amount of temporary digestive disturbance which is usually met with; and within a few days I have seen a case where the catamenia returning produced no effect whatever on the infant; and this is merely an instance of what, in all probability, frequently occurs where mother and infant are at the time in a normal condition. There have as yet been too few analyses made during the catamenial period to justify us in making any definite conclusions as to the chemical status of the question; but the probability is that the milk will be found to be deficient in fat, and to have its albuminoids increased, following the general rule of disturbed mammary secretion, and consequently, for the time, being in a condition to interfere with both digestion and nutrition.

It may be of interest, from what has been said above con-

cerning the variations in the milk which may arise from emotional causes and menstruation, to report the analyses of the milk of a mother and a wet-nurse where these influences appeared to produce certain chemical changes. The mother, a healthy, but rather delicate, primipara, the period of whose pregnancy had been supervised by me with the greatest care, and whose temperament was subject to the greatest extremes of despondency and excitement, was delivered in March, after a short and easy labor, of a healthy boy.

She was exceedingly anxious to nurse her infant; but, within a few hours after its birth, she was seized with an uncontrollable fear that she would be unable to do so. In spite of all the assurances which could be given to her to the contrary, and the plentiful supply of milk which in due time came in the breasts, she remained in a very nervous, despondent condition; and as the infant began to show decided signs of indigestion I thought it best, before proceeding further, to investigate the composition of the milk. This resulted as follows, and plainly showed the necessity of not persisting further, as it was so altered, apparently from unavoidable nervous conditions, which seemed likely to recur through the whole of her lactation: —

ANALYSIS VIII.

Mother's Milk.

Fat	0.62
Sugar	5.80
Albuminoids	4.21
Ash	0.20
Total solids	10.83
Water	89.17
	100.00

Under these circumstances, although there was an abundant supply of milk, a healthy wet-nurse, whose baby was strong and thriving, was procured, and the infant immediately began to gain in weight and ceased to show any digestive disturbance. After a month, however, the infant,

on being weighed, was found not to have made its weekly gain and to be having rather more frequent fæcal discharges than usual. It was then discovered that the wet-nurse was menstruating, and an analysis of her milk was made on the second day, resulting as follows: —

ANALYSIS IX.

Wet-Nurse. — Catamenial Milk, 2d Day.

Fat	1.37
Sugar	6.10
Albuminoids	2.78
Ash	0.15
Total solids	10.40
Water	89.60
	100.00

The catamenia lasted only about four days, and did not return for some months.

The infant after the first twenty-four hours showed no disturbance whatever, soon began to gain again, and was not affected by the subsequent recurrence of the catamenia. An analysis made a week after the catamenia had ceased showed a decided change for the better, that is, increased fat, decreased albuminoids, and, forty days later, a still greater improvement, as was expected from the blooming condition of the infant.

ANALYSES X. AND XI.

Wet-Nurse.

	X. Seven Days after Catamenia.	XI. Forty Days after Catamenia.
Fat	2.02	2.74
Sugar	6.55	6.35
Albuminoids	2.12	0.98
Ash	0.15	0.14
Total solids	10.84	10.21
Water	89.16	89.79
	100.00	100.00

Although it is admitted that a large per cent. of surplus fat is frequently found in the napkins of infants whose digestion and nutrition are normal and whose food is breast milk, yet we have no more right to conclude from this that a small per cent. of fat is sufficient for nutrition, or that a large per cent. will be taken care of by this outlet, than we have to assume that there is too much oxygen in the blood because we find that a certain surplus of oxygen is found to have been in the arterial blood and returned to the lung in the pulmonary arteries. In fact, it is far more probable that nature introduces a certain per cent. of fat in human milk with a purpose which can only be accomplished by that per cent., and that it is an error to vary this per cent. beyond the variation which commonly occurs in average human milk. The production of animal heat is such a very important part of the young infant's well-being, that it is not surprising that we should find such a large per cent. of fat and sugar in the food which is provided for it. We should remember also that, while the sugar is the more digestible of the two, the fat contains more potential energy (that is, heat-producing power) in a given weight than the sugar, and that its presence in the milk is not only for the purpose of nutrition, but is a means for the maintenance of the bodily heat.

This function of the fat cannot be trifled with, with impunity, and is essential for that active metabolism which forms such a prominent feature of the infant's growth. A proper amount of fat proportionately to the albuminoids is probably necessary for, or at least of great aid in, the proper digestion of these albuminoids and the regulation of the fæcal discharges.

From what has been said above we would naturally expect that, unless the standard per cent. of fat was attained, or at least a near approach to it, trouble would be likely to arise; and this corresponds to my individual experience in the cases where the especial ingredient which was disturbing the success of the food was the fat; for I have found clinically that under the proper per cent. of fat the nutrition suffers, the digestion is not so good, and that there is a tendency to con-

stipation; while where the fat percentage was decidedly above the standard, the digestion was very much affected, there was a tendency to diarrhœa, and in consequence a resulting poor nutrition. We see, then, in accordance with what has been said above, we should in cases where the milk is found to be poor in fat reduce slightly the amount of fatty food taken by the mother and increase the albuminous elements.

In this connection the case of a healthy primipara, who was under my care, will be of interest. She had plenty of milk, but the baby suffered from colic, and had very frequent watery dejections.

It would seem natural for us, then, in this case, to find, under these circumstances, a surplus of fat percentage in the milk, and this proved to be the case, as seen in the following analysis: —

Analysis XII.

Primipara — Healthy — Eating much meat — Not taking much exercise.

Fat	4.96
Sugar	6.60
Albuminoids	3.29
Ash	0.17

In this case it was deemed best to reduce the meat to a minimum, which was done, and three days later an analysis gave the following figures: —

Analysis XIII.

Eating little meat.

Fat	1.73
Sugar	5.70
Albuminoids	3.74
Ash	0.13

The milk was now found to be lessening in quantity, and the infant's dejections were less numerous and had more con-

sistency; but the infant was not gaining, and continued to have pain. In fact, the analysis now showed a poor milk, as represented by the usual combination of low percentage of fat and high percentage of albuminoids found in poor milks. We, therefore, had a milk too poor for nutrition, and we now had to make it richer again. The mother was consequently made to eat a moderate amount of meat, and to exercise more, and three or four days later the analysis showed an improvement in the fat.

Analysis XIV.

Eating moderate amount of meat — Taking more exercise.

Fat	2.42
Sugar	5.50
Albuminoids	3.55
Ash	0.15

The infant now began to have regular movements, of good consistency, and no longer had pain; it also began to gain in weight. The milk again became abundant. From the variations which have been mentioned, and must always occur, we, of course, must frequently fail to regulate the milk in this way; but the proper understanding of the function which we are dealing with will at least aid us in treating these cases intelligently.

A few words regarding the correspondence of the size of the infant's stomach to the infant's weight may be of interest where we wish to regulate the amount of artificial food which we may in an especial case wish to give. I find the following in my notes on this subject, and also the case of a rachitic child under my care in Ward L.

Of the different causes which regulate the gastric capacity the weight of the infant has the greatest influence, and it is perfectly possible for a poorly developed infant of small weight to have a gastric capacity no greater than a normally developed infant of half the age. This possibility must be taken into account when we attempt to regulate the bulk of an artificial food to the age of the infant. An infant of six

weeks has been brought to me, whose general development and weight corresponded so closely to the normal average infant of twelve weeks that it was self-evident that the two ounces of food which would ordinarily have been the proper allowance, so far as its age was concerned, was not sufficient, and that its weight indicated a gastric capacity for an allowance of four ounces, which in fact it took and digested with the greatest ease, while with any amount less than the four ounces it was never satisfied.

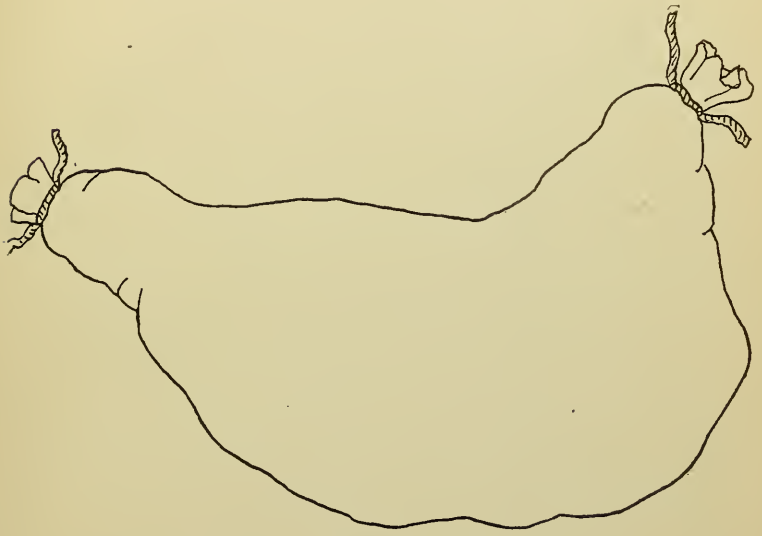

Diagram I.

Diagram I. represents in life-size the stomach of a female breast-fed infant, twelve months old. This infant's weight was 4,289 grammes, which corresponded to about the weight of the average normal infant of two to three months. The gastric capacity, 120 c.c. (4 ounces), corresponded to the weight rather than to the age. The stomach is of about the normal shape of a breast-fed infant.

Another very important influence [1] on the gastric capacity is the kind of nourishment which the infant has received. The breast-fed infant, in its early months of life, has a uniformly developed stomach, and, as a rule, of smaller capacity

[1] Fleischmann, Die Ernährung des Sanglingsalters, p. 17.

than the stomach of the artificially fed, the muscular fibres of the fundus in the latter stomach being weak and its form abnormal.

It is common in the artificially fed, where the quality of the food has been poor, and the quantity too large for the age and development, and where rachitis has been a consequence, to find the stomach dilated to a capacity entirely out

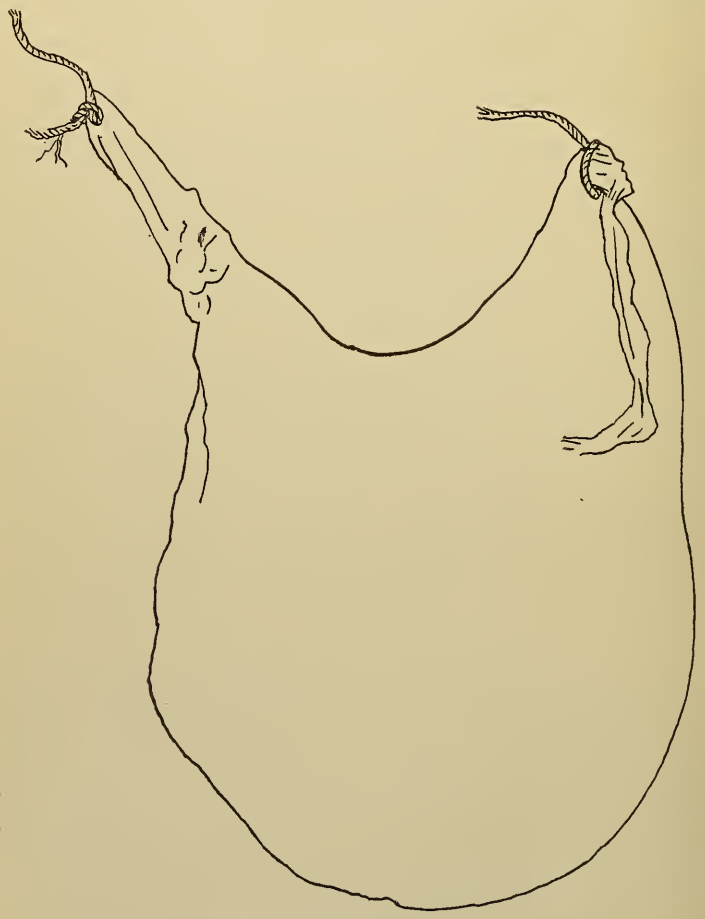

Diagram II.

of proportion to the infant's age and weight. Diagram II. represents in life-size the dilated stomach of an artificially fed, rachitic infant, seven months old. The gastric capacity in this case was 300 c.c. (10 ounces), corresponding to the

average infant of twelve months; and the shape of the dilated stomach, with its very much increased greater curvature, and its lessened smaller curvature, is very significant.

The question as to whether, in the preparation of an artificial food, we should use milk-sugar or cane-sugar, has so often been asked, that my notes on this subject may be of some interest, and I think one of considerable practical importance, so that, as a conclusion to this paper, I will give them in as concise a form as possible.

Regarding the kind of sugar which should be used in making up an artificial food we have certain questions to consider which would seem to be not altogether unimportant. Cane-sugar has been in the past, and is still, a favorite form with which to regulate this part of the solid constituents of the food; and the reasons given for using it have been its preservative qualities, as seen, for instance, in the manufacture of condensed milk, and the theory that it is not liable to set up excessive so-called lactic-acid fermentation, with its consequent disturbance of digestion, as is supposed to be the case with milk-sugar. Cane-sugar in a concentrated form, as it is found in condensed milk, seems to act as a preservative; when, however, it is diluted, as in its administration to the infant, the cane-sugar ferments very readily, and under these circumstances is no better than milk-sugar. Reasoning from analogy, we should say that milk-sugar being the form which is always found in the milk of all mammals, it would be natural to suppose that this form of sugar has been put there for some good purpose, and that it is needed for the accomplishment of some process which takes place after the food has been swallowed by the infant. Both cane-sugar and milk-sugar are converted into glucose in the intestine. There seems, however, to be some difference in the degree to which they can be used for purposes of nutrition before they are converted into glucose. Cane-sugar, so far as is known, is merely a reserve, and cannot be directly used for nutrition; in fact, this holds true in whatever it exists, whether in plants or in animals. Milk-sugar, on the other hand, is probably not merely a reserve, but may possibly be utilized as such in the economy. Thus, Bernard[1] has

[1] Flint, Physiology, 1879, p. 467.

shown that seven grains of milk-sugar dissolved in an ounce of water could be injected under the skin of a rabbit without the subsequent appearance of sugar in the urine; while under the same conditions, and in the same amount, cane-sugar was found to be eliminated as foreign matter by the kidneys.

Milk-sugar undergoes no direct alcoholic fermentation, but readily undergoes a change to lactic (possibly acetic) acid in the presence of nitrogenous ferments; while cane-sugar easily undergoes alcoholic fermentation, but changes to lactic acid less readily than milk-sugar; cane-sugar, however, takes on the butyric-acid fermentation more readily than milk-sugar.

It is now supposed, from the investigations of Escherich on this subject, that a bacillus called *Bacillus lactis aërogenes* is present in normal digestion for the purpose of acting on the milk-sugar to produce an organic acid which will drive out the more noxious forms of bacteria, which by their presence would interfere with normal digestion. When, also, milk-sugar is converted into glucose, we physiologically have a gradual conversion into lactic acid, which may aid in the digestion of the albuminoids, thus giving us a very valuable addition to the means at our command of rendering modified cow's milk digestible.

I am indebted to Dr. John A. Jeffries for the following information on this subject: —

"In reference to the question as to the difference of the various kinds of sugar in the digestive tract the following seems to be of interest. Starch, dextrin, inulin, cane-sugar, and dextrose afford material for the butyric-acid fermentation; milk-sugar first after completed hydration."

Again, Escherich,[1] in speaking of Brieger's bacillus, says: "Milk is coagulated with sour reaction first after several days (eight to ten) at the body temperature. With exclusion of air this bacillus cannot grow either in milk or milk-sugar solution, but will in grape-sugar.

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[1] According to Escherich this organic acid is lactic; while Bagnisky holds that the *Bacillus lactis aërogenes* turns milk-sugar largely into acetic acid, producing only minimum amounts of lactic acid, and he suggests the name of *Bacillus aceticum* for this form of bacterium.

"We thus see that the milk-sugar offers less danger of the butyric-acid ferment, which we know makes much trouble at times in the body, and under the conditions of the intestine should be exempt from the assaults of Brieger's bacillus."

When, in connection with what has been said above, we consider that by means of sterilization we can practically put an end to the lactic-acid fermentation which may have begun to act on the milk before it enters the stomach, it would seem that we are justified, on both physiological and bacteriological grounds, in using the same animal sugar in our artificial mixtures which is found in the infant's natural food, instead of introducing a vegetable sugar, which in any milk is a foreign element.

The dangers from lactic acid are, at any rate, much exaggerated by writers on this subject, and there are many other questions which, if more carefully attended to, would render the supposed evil results of the lactic-acid bugbear much less noticeable.

SURGICAL ABSTRACT.[1]

By George W. Gay, M.D.

OPERATIONS UPON THE LARGER BLOOD-VESSELS.

Ligature of a large artery is not so common an event, even in a large hospital, but that a brief abstract of the cases must possess some interest. For that reason, a short account is here given of the principal operations of this kind which have been done in this hospital during the past ten years.

Aneurism of axillary artery without pulsation; incised; ligature of subclavian artery; recovery.

A man aged 42 years had a large, elastic, lobulated tumor completely filling the left axilla. The tumor did not pulsate. The left arm had been amputated half-way to elbow many years before. Ether. Incision. Sac contained bloody serum and old clots. The diagnosis now being clear, — it had not been previously, — an attempt was made by Dr. Gay to do Bell's operation, which consists in controlling the opening in the artery with the finger, while the wound is enlarged, the vessel dissected out, and the double ligature is made fast. This was found impossible, on account of the depth of the vessel. The sac was packed with sponges, and the subclavian artery was tied in its outer portion with three silk ligatures. An attempt was made to divide the vessel between the ligatures, but was abandoned for lack of space. Notwithstanding the facts that this patient was a hard drinker, that he had extensive phlegmonous erysipelas requiring incisions, and that he had a slight secondary hemorrhage, yet he recovered, and remains well at the present time, now two years after the operation.

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[1] To Dr. W. H. Prescott and Dr. H. S. Smith the writer is indebted for the statistics required in this article.

Aneurism of innominate artery; ligature of common carotid and subclavian arteries; recovery from operations; death several months later; partial autopsy.

John H., aged 42, was treated in this hospital in March, 1883, for neuralgia. In September, 1884, he again entered the hospital for a small tumor behind the right sterno-clavicular articulation, of three weeks' duration. It was about two inches in diameter, and pulsated strongly. It was evidently an aneurism of the innominata, or of one of its terminal branches. The patient was placed under Dr. Lyman's care, and underwent a long and faithful treatment by rest, iodide of potash, pressure, etc., with a good deal of temporary benefit.

Dec. 11, 1884, the common carotid artery was tied by Dr. Gay. Two ligatures of stout carbolized catgut were applied about three-fourths of an inch apart, and the vessel was then divided between them. The ends at once retracted fully half an inch within their sheath. The wound was healed in a week, the operation having been followed by no unfavorable symptoms whatever. Seven weeks later the subclavian artery was tied in the third portion in the same manner. No disturbance to the hand and arm resulted, and the wound healed kindly. It was thought that the tumor was a little softer and smaller after each operation. The man remained quietly in bed for about five months, during which time he grew fat, and was very comfortable. On leaving the hospital, short breath, pain, and other symptoms of disturbed circulation came on, and four months later he returned to the hospital to die. A hasty and partial autopsy was all that was allowed. The under surface of the clavicle was worn away to a considerable extent, and the first rib was eroded from pressure. The aneurism extended from a point one and one-half inches above the clavicle, downwards, to the left of the vertebræ about eight inches. The transverse diameter was about five inches, and the estimated capacity between one and two pints. The trachea and œsophagus were displaced to the left. The sac contained a large laminated mass of fibrine, and at the lower part two or three ounces of soft clotted blood. The carotid was impervious

for an inch; the subclavian was patent for an equal distance. Both vessels emerged from the posterior surface of sac. Vertebræ not eroded.

That this patient was very much benefited by the rest in bed there can be no doubt. It is doubtful if the same can be said of the surgical treatment. Theoretically both vessels should have been tied at the same time; but, owing to the altered relations of the structures, the operation must have been long, tedious, and exhausting to the patient. It is extremely doubtful if more is to be expected from any treatment of these large aneurisms in the chest than a prolongation of life, and a partial relief to pain and other distressing symptoms.

Aneurism of popliteal artery at its bifurcation; ligature of femoral artery; recovery.

A cigar-maker, 30 years old, entered the hospital with a tumor about three inches in diameter situated at lower border of popliteal space of left leg. Had suffered pain in the limb for a year, but had noticed the bunch only two months. Tumor pulsated, and this was controlled by pressure upon the femoral. Treatment by bandages, flexion, and other kinds of pressure proving of no value, Dr. C. D. Homans tied the femoral artery at the lower part of Scarpa's triangle. The ligature came away in eighteen days; the wound was healed in twenty days. At the time of his discharge from the hospital the tumor was the size of a walnut, and was free from pulsation or other unfavorable symptoms.

Brachial aneurism; traumatic; following phlebotomy; ligature of brachial artery; recovery.

Mr. X., aged 65 years, insisted on being bled, saying that he preferred that treatment to taking "spring medicine." Had been bled before without mishap. On this occasion the artery was nicked. A pad and bandage were applied in the usual manner. The next day the arm was said to be "black and blue" to the shoulder. Dr. Gay saw the patient for the first time five weeks later. The only noticeable lesion at that time was an elastic, pulsating tumor, about an inch and a half in diameter, situated over the left brachial artery, just above the flexure of the elbow.

Ether; artery tied above and below the tumor with catgut. Vessel divided between ligatures. Convalescence slow; wound about a month in healing; hand was red, shiny, and for a long time extremely sensitive and painful, as is often seen in cases of senile gangrene. The skin did not break down, however, and the stiffness of fingers gradually disappeared. The pulse came back in the left radial in about two months. It was about six months before the patient was enabled to do much with the hand.

I have tied the brachial artery in the same manner for hemorrhage caused by the erosion of a drainage-tube. The patient did well. The primary affection was central necrosis of shaft of the humerus.

Popliteal aneurism; ligature of femoral artery in Scarpa's triangle; recovery from operation; gangrene following exposure; amputation of leg; recovery.

A colored man, aged 36, entered hospital with large, hard, non-pulsating tumor in right popliteal space. Duration three months; femoral artery tied; wound healed; patient left the hospital in three weeks, against advice, and walked about a good deal. Came back in ten days with gangrene of foot. Leg amputated six inches below knee. Recovered after a tedious convalescence, and was well eight years later.

The method of applying two ligatures to a large artery, and then dividing the vessel between them, has been practised by myself in a few cases with satisfactory results. There are good reasons for its more general adoption. One of Nature's most important hæmastatics is the retraction of the ends of the divided vessel within its sheath. Every surgeon knows that an artery which has been completely severed will cease bleeding much sooner than a wounded one, for the reason that in the former case the extremities retract as well as contract, and thus diminish their calibre. The operator who has once seen the two parts of a divided artery retract to the extent of one-half, or even three-quarters, of an inch will require no argument to convince him of the importance of this procedure. I have tied the common carotid, the subclavian, and the brachial twice in this manner, with most gratifying results. The ideal way

of tying a large vessel would seem to be by using careful antiseptic precautions, dividing the vessel between two (catgut) ligatures, closing the wound with a continuous suture of the same material, inserting a drainage-tube or not, according to the depth of the wound, and paying due attention to position, temperature, and surroundings. The easier and quicker the reparative process takes place in the wound around the extremities of the vessel the less danger there must be of secondary hemorrhage, which has always been the bane of these operations. Hence the importance of the measures mentioned above.

TRACHEOTOMY AND INTUBATION IN THE TREATMENT OF CROUP.

Since the last quinquennial report of this hospital was issued a new operation for the relief of acute laryngeal stenosis has been devised and brought before the profession by Dr. J. O'Dwyer, of New York. The operation is known as intubation, and consists in the introduction of a tube of peculiar shape inside the larynx. As this tube is passed into the mouth no cutting, and hence no anæsthetic, is requisite. The experience of numerous operators has demonstrated, beyond a reasonable doubt, the great value of this operation. It by no means supplants tracheotomy; but in many cases it answers every purpose of the older operation, and in a way more agreeable to the patient, to the friends, and to the surgeon. While there is some danger from dislodged membrane blocking up the tube at the time of its introduction and afterwards, yet, contrary to our expectations, it is less liable to "gum" than is the tracheotomy tube. The immediate relief to the dyspnœa from the new operation is not as marked as after the old one, in the majority of cases. The tube is liable to be coughed out occasionally, — a serious event in the severer cases, as suffocation may take place unless it can be replaced at once. In the lighter cases there oftentimes need be no haste in returning the tube to its place.

One of the most serious objections to the new method is the difficulty, often experienced, in giving the patient sufficient nourishment. Unless the tube fits into the larynx accurately, so as to allow the epiglottis to completely close the entrance,

liquids will enter the trachea and cause coughing. It is a singular and well-attested fact, however, that no food of any consequence has ever been found in the air-passages at the autopsies made upon these patients. Hence the harm resulting from its escape into the trachea is merely transitory, and need not deter the nurse from persisting in urging food upon the patients. Soft solids, like eggs, ice-cream, mush, and so on, are swallowed more readily than liquids. The tube is worn about the same length of time as the tracheotomy tube, *i.e.*, from five to seven days in the favorable cases. As consent to do the new operation is more readily given, it can be done at an earlier period than the cutting operation. Two assistants are required, — one to hold the child in his lap, and the other to hold the gag and child's head. The mouth being well opened by the gag, the surgeon passes his left forefinger into the fauces till it reaches the epiglottis, which latter is to be raised and drawn forwards, while the tube is carried behind it, and on into the larynx. The tube must be well crowded down before the finger is withdrawn. Should it enter the œsophagus it is drawn out by the string, which should always be attached for that purpose, and another attempt made to place it in position. Should the child be very much exhausted, from septic or other causes, this operation must be done quickly to avoid collapse from the momentary strangulation or suffocation necessarily attending its performance. The septic cases, moreover, are often difficult to intube, from the presence of great tumefaction about the epiglottis and adjacent structures. Unless one is reasonably familiar with the manipulations, he would probably be able to do tracheotomy with more satisfactory results, under these circumstances. Dislodged membrane occasionally obstructs the O'Dwyer tube, and, unless it is ejected or removed, death ensues. If the patient be reasonably strong he coughs out the tube under these circumstances, in a majority of instances.

The results of the two methods of treatment in this hospital are as follows : —

Of three hundred and twenty-seven cases of tracheotomy performed here prior to the introduction of intubation, ninety-

five, or twenty-nine per cent., recovered. In one hundred and forty intubations, twenty-eight, or twenty per cent., were successful, — a difference of nine per cent. in favor of the old method. The variations in the statistics of these operations, the results of which depend so largely upon the type of the disease, must be constantly borne in mind. In my last report on this subject, made in September, 1888,[1] the difference in favor of tracheotomy was only five per cent. Since that report was made up, the type of the disease has been very severe, as is shown by the high mortality. Further evidence of the truth of this statement is furnished by the fact that in the last thirty-three cases of intubation, ten of them also underwent tracheotomy, and all died. Both operations have been done, in all, twenty times in this hospital, and every patient has died. The type of the disease, rather than the mode of treatment, determines the result.

It is claimed that the new operation gives better results in children under three years of age than the old one. It is well known that tracheotomy in the very young is not a successful mode of treatment. Waxham and Huber report favorable results in twenty-five and thirty-four per cent., respectively, of their intubations under three years of age. O'Dwyer's experience is less favorable, his recoveries being only about fourteen per cent. Stern has analyzed five hundred and nineteen cases of intubations under three and a half years of age ; and, comparing these with thirteen hundred tracheotomies reported by Bourdillat, he finds that the new operation is followed by more recoveries under four and a half years, after which period the old operation appears to be more successful.

In this hospital the ratio of recoveries in children under three is about the same. In eighty-three tracheotomies and in twenty-nine intubations the percentage of recoveries was respectively twelve and thirteen per cent.

The advantages of intubation in *favorable cases* are, that it is easily and quickly performed ; as there is no cutting, there is hence no hemorrhage ; no anæsthetic is required ; con-

[1] Boston Med. and Surg. Journal, Oct. 11, 1888.

sent for its performance is more readily granted; it can then be done earlier; the tube takes care of itself; it is well adapted for young children.

On the other hand, intubation may be difficult, or even dangerous to perform; it may not relieve the dyspnœa. The tube may be coughed out repeatedly, or it may be swallowed; during effort at removal it may slip past the vocal cords into the bronchi; it may "gum," thus requiring frequent removals; it may become occluded suddenly, and, unless speedily ejected or removed, death may ensue; great difficulty may be experienced in feeding the patient.

In short, it may be said that both operations are often attended with difficulties, and occasionally with danger; both are liable to accidents; the mortality attending them is about the same; the fatal results in a majority of cases are due to the extension of the disease to the lungs, and this occurs as frequently after one operation as after the other; in neither case is the treatment the cause of the complication, nor does it prevent or cure it.

Intubation is preferable in very young children; tracheotomy, in adults. Intubation is probably safer in those cases in which the tube must be left to take care of itself. It may be resorted to preliminary to tracheotomy. Intubation may be done for euthanasia, providing the operator is reasonably expert, and can do it quickly without inducing collapse.

Tracheotomy is called for in cases in which the new operation cannot be done, or in which, having been done, it does not relieve the dyspnœa; in which the tube is frequently coughed out, or in which it does not keep clear and requires frequent removals; and also in cases in which sufficient food cannot be given on account of difficulty in swallowing.

LAPAROTOMY.

Thirty-eight laparotomies have been performed during the past ten years. This number does not include a good many cases of penetrating wounds of the peritoneal cavity. Only those are noted in which the cavity has been opened and explored for various purposes. Of thirteen ovariotomies three

died: one from nephritis (chronic); one, a cancer of ovary, from peritonitis; and the cause of death in the other case is not recorded. Eight cases of peritonitis were treated by abdominal section, all fatal but one; one case of tubercular peritonitis was discharged in three days, result unknown. A young man, with acute peritonitis most marked in the right iliac region (appendicitis?), was operated upon on the third day, by Dr. Gay. Pus was found; adhesions not disturbed very much; drainage-tube; wound healed in about ten days. Every case of abdominal section for acute general peritonitis, not specially marked in any region, resulted fatally. A limited experience with surgical measures in this affection gives little encouragement for their adoption. Localization of the disease, as shown by a circumscribed induration or tumor, or dulness, calls for interference, with good prospects of success. In these cases pus is usually found, which may or may not be walled off from the general peritoneal cavity. But whether it is or not, the indications for treatment are clear and imperative: incision, irrigation, and drainage. It goes without saying that abdominal surgery means antiseptic surgery. At all events, such is the fact in this hospital and vicinity.

Foreign body in appendix; laparotomy; death.

An adult, a policeman, was seized, a few hours after eating heartily of canned lobster, with a severe pain in the region of the navel. He was sent to the hospital by Dr. Forster, and laparotomy in the right inguinal region performed by Dr. Gay, on the third day. Fetid pus was found in moderate quantity. The appendix was the size of the little finger, and was perforated at about its central portion. From the part nearest the cæcum was removed a piece of solder the size of a large pea. The operation seemed to have neither good nor ill effect upon the patient. He steadily failed, and died from peritonitis about thirty hours after the operation, although apparently in very fair condition at the time of its performance.

Exploratory incisions were made, in one case, of cancer of stomach, and, in one, of cancer of gall-bladder. The former patient recovered readily from the operation, dying, some

weeks later, from the disease. The latter patient died in two days. In both cases the disease was too extensive to warrant any attempt at removal. Several cases were sent to the hospital with a diagnosis of "intestinal obstruction." The obstruction was due to general peritonitis, and in every case in which abdominal section was made the result was fatal. Laparotomy for the evacuation of serum in general peritonitis has not been successful in this hospital, nor has it been so in my private practice.

In one case of gunshot wound of abdomen, just below the ribs, Dr. Bolles enlarged the opening very freely, tied a large vessel in the mesentery, and sewed up four penetrating wounds of the intestine. The patient did not rally fully from the operation, having lost too much blood before reaching the hospital. In another case of gunshot wound of abdomen the wound was enlarged, the peritoneal cavity found distended with blood. At the autopsy the ball was found lodged in the inferior vena cava.

In several instances wounds of abdominal cavity from stabs, followed by a protrusion of omentum, were successfully treated by returning the substance; and in one case, in which Dr. Post cut off five inches of the protruding mass, a good recovery followed. It is not wise to remove too much of this structure, however, on account of the subsequent adhesions, which may give great trouble. This was shown in one unfortunate case of strangulated omental hernia, in which it was thought best to remove a large mass of omentum. The result was extensive adhesion of the omental stump, obstruction of the bowels, as indicated by violent colic, vomiting, constipation, and emaciation, not relieved by a laparotomy. Death followed in several weeks after the primary, and in a day or two after the secondary, operation.

An exploratory operation was made by Dr. Gay in a case of fibro-cystic tumor of uterus. A large cyst, containing about two gallons, was emptied by abdominal section, the cyst drawn out of the peritoneal cavity, its attachments examined, and found to involve the whole uterus and its appendages. The wound in the cyst was closed with catgut, and it was returned to its original position. The patient

recovered, and now requires tapping once a month, having already undergone twelve operations. I was influenced in my treatment of this case by the fact that recovery from a complete removal of these large fibro-cysts of the uterus is comparatively rare. Such a result has never followed the few operations which have been done in this hospital, or, I think, by its surgeons in private practice. One case of this affection was under my care for some years, in which the abdomen was tapped ninety times, about three pailfuls of fluid being withdrawn at each operation. It is now four years since she has required tapping, and although she has a large tumor, yet it does not cause her enough discomfort to prevent her from earning her living with the needle.

A large tumor which has grown within a year, and is attended with much pain, has proved to be malignant in several cases which have been observed in this hospital.

Dr. Cheever removed the uterus by laparotomy for multiple fibroids, with a fatal result. Hysterectomy, either abdominal or vaginal, has not proved a successful operation here, although it has not been resorted to in many instances.

MISCELLANEOUS.

Extroversion of the bladder; plastic operation, with satisfactory result.

Boy, aged 6 years, was operated upon by Dr. Gay for the above malformation, in the following manner: A large oval flap was turned down from above, the cutaneous surface lying upon the mucous membrane. This flap was then covered by skin raised from each groin, the pedicles being at the lower extremity of the flaps. The object of this arrangement of the flaps was to prevent the covering to the bladder being removed as it contracted during the healing process. The pedicle of one flap being above the bladder, and those of the others or side flaps being below, they opposed each other during convalescence, and the result was all that could have been desired. Two complications were met with in this case. First, the penis, which was deeply grooved on its upper surface, acted as an obstruction to the

flow of urine from under the flaps. It was amputated, and no further trouble from this source was experienced. Second, after the inflamed surface of the bladder wall was covered in, there ensued a copious deposit of phosphatic gravel, which caused much suffering. Frequent irrigations, and getting the boy upon his feet, remedied this complication. The boy passed through a sharp attack of scarlet fever soon after the operation, yet he made a good recovery. It should have been said that the flaps were carefully secured in position by numerous black-silk sutures, and the surrounding skin was as closely approximated as possible by shirt-button sutures. A metal cap was fitted to the bladder so accurately[1] that all the urine was caught and drained into a rubber receptacle secured alongside the thigh. The results of this operation were very gratifying, from the fact that the unfortunate boy was no longer a nuisance to himself and to every one about him, by reason of the urinous odor, but with care could keep himself clean and comfortable.

Pyonephrosis; incision; most of the urine, and at times all of it, passed by the wound.

A young man, 23 years of age, entered the hospital with a tense, elastic, lobulated tumor in right lumbar region, of about a month's duration. Has had gonorrhœa for a month. Tumor increased in size daily; not very tender, nor painful.

Laparotomy over the most prominent portion of bunch. Cyst tapped and sewed to abdominal walls by a double row of sutures, and then incised. Between one and two pints of thin, dark liquid, containing lymph, were evacuated. For nearly a week after operation no urine was passed in the natural way, and only about two ounces could be obtained by the daily use of the catheter. No uræmic symptoms. Very little disturbance from the operation. Discharge became purulent and profuse in a fortnight. Up in chair in about three weeks, and walking in six weeks. Most of the urine was being passed by the artificial opening, and was

[1] By Messrs. Leach & Green.

caught in a bag fastened to the body, which received the drainage-tube. A year later his condition had not changed materially. Very little urine was passed in the natural way, most of it coming from the tube in the side.

As this patient passed so little water from the bladder, it is an interesting question to determine the condition of the left kidney. Did he have a double or "horse-shoe" kidney, or did he have only one, — the right kidney? There was never any distention of the bladder, nor were there any uræmic symptoms. Further light is desirable.

Intussusception; laparotomy; recovery.

Girl, 5 years old, was suddenly seized with severe belly-ache after some error in diet. Tumor in right side abdomen, movable, and not very tender, detected on the second day. Cramps, vomiting, constipation, and a tumor were the characteristic features of the case. Dysenteric symptoms were absent throughout. Laparotomy by Dr. Gay on the third day. Ileum was invaginated in the colon through the ileo-cæcal valve for about six or eight inches. No adhesions. The constriction at ileo-cæcal opening was carefully dilated, and the invaginated bowel easily pulled out, there being no adhesions and little congestion. Convalescence was prolonged by ulceration about the silk suture in the peritoneum. The patient is well three years after operation, with the exception of a small hernia, which is readily controlled by an elastic belt.

Rupture of kidney; suppuration; death.

Girl, 9, being frightened, jumped out of a bath-tub and fell, striking her left loin upon a water-pail. Hematuria soon set in. Peritonitis followed by vomiting, diarrhœa, and emaciation. Sixteen days after the injury a tumor in left iliac region was freely opened, and a quart of dirty fluid evacuated.

She died from vomiting and exhaustion two months later, and at autopsy the lower part of left kidney had entirely disappeared, leaving a small piece not over two inches in diameter lying in a depression formed by the surrounding inflammatory products. The cavity had been thoroughly drained, and there were no sinuses. Had the whole kidney

been removed early, the result might have been more satisfactory.

Distended gall-bladder (cyst); laparotomy; recovery.

Miss E., aged 20, was seized with a severe attack of peritonitis in August, 1887. A tumor had been noticed in region of gall-bladder for over a year. It was soft, painless, and not tender. No vomiting, jaundice, nor emaciation. Four pints of thick brown fluid, which was found to be bile, were withdrawn by aspiration in September. About the same quantity was removed in January, 1888. Four months later, the cyst having refilled, laparotomy was done. The sac was emptied, and then stitched securely to the abdominal walls. No calculus could be found in cavity.

The operation was followed by a sharp attack of peritonitis unattended by delirium or prostration, and lasting about a week. The discharge of bile, profuse at first, gradually diminished, and when she left the hospital in June it was very slight. The wound has now been closed for four months, and the patient is well. She is at her usual work, as a clerk, and suffers little inconvenience from her former malady.

That all the bile in this case was not carried off by the wound was shown by the fact that she did not emaciate as patients usually do under those circumstances, and that the stools showed the presence of bile. There were no symptoms of gall-stone colic at any time, and no gall-stones were ever found. The cause of the affection is not apparent.

Twice within two years I have been called upon to open large abscesses in the region of the gall-bladder. Profuse discharges of bile came from one occasionally, but no gall-stones, and none could be found at time of operation. This case occurred in an elderly gentleman, and the sinus has not yet permanently closed, although he is about his business. The other case has entirely recovered, but no bile was ever seen in the discharges. The abscess was located just below the liver, and was four or five inches deep.

Separation of symphysis pubis in a heavy man; suppuration; perfect recovery.

Mr. X., aged 55 years, fell with his horse while

riding horseback, and injured the symphysis upon the pommel of the saddle. Swelling and discoloration of scrotum and penis followed. Had little, if any, pain at any time during his illness. Kept about upon his feet a little for a month, walking with a rolling gait; then had chill, and an indurated spot appeared just beneath scrotum; ether; opened by Hilton's method; abscess, four inches from surface, contained about half a pint of pus. Motion of pubic bones plainly felt by finger in the wound. Thorough drainage and cleanliness. Was in bed three and one-half months. Did not walk any of consequence for seven months; then began to go with crutches, wearing a firm pelvic belt of leather. Discarded his crutches within a year from the time of the accident, although the belt was worn for two or three years. Although this patient weighs two hundred and thirty pounds he has entirely recovered from his injury, leads an active life, and says that he is as well and as strong as ever he was. The result in this case seems particularly fortunate, when it is remembered that a similar accident in women at the time of delivery is not infrequently followed by permanent lameness, or even complete inability to walk. His vigorous state of health was the most important factor in his recovery.

Statistics of the Major Amputations (211) at the Boston City Hospital (1879-1889).[1]

Place.	Traumatic Primary.				Place.	Traumatic Secondary.				Place.	Pathological.				Place.	Grand Total.			
	Recovered.	Died.	Total.	Per cent. Mortality.		Recovered.	Died.	Total.	Per cent. Mortality.		Recovered.	Died.	Total.	Per cent. Mortality.		Recovered.	Died.	Total.	Per cent. Mortality.
Hip	. . .	. . .	. . .	. . .	Hip	. . .	. . .	. . .	. . .	Hip	6	1	7	14.28	Hip	6	1	7	14.28
Thigh	4	4	8	50.00	Thigh	5	3	8	37.50	Thigh	26	9	35	25.72	Thigh	35	16	51	31.37
Knee	2	1	3	33.33	Knee	1	. . .	1	. . .	Knee	2	. . .	2	. . .	Knee	5	1	6	16.66
Leg	21	6	27	22.22	Leg	13	4	17	23.53	Leg	33	1	34	2.94	Leg	67	11	78	14.00
Ankle	5	. . .	5	. . .	Ankle	1	. . .	1	. . .	Ankle	3	1	4	25.00	Ankle	9	1	10	10.00
Shoulder . . .	4	2	6	33.33	Shoulder . .	1	. . .	1	. . .	Shoulder . .	1	. . .	1	. . .	Shoulder . .	6	2	8	25.00
Arm	12	3	15	20.00	Arm	1	2	3	66.66	Arm	7	2	9	22.22	Arm	20	7	27	25.93
Elbow	1	. . .	1	. . .	Elbow	. . .	. . .	. . .	. . .	Elbow	. . .	. . .	. . .	. . .	Elbow	1	. . .	1	. . .
Forearm . . .	12	. . .	12	. . .	Forearm . .	1	1	2	50.00	Forearm . .	9	. . .	9	. . .	Forearm . .	22	1	23	4.35
Total	61	16	76	21.05	Total . . .	23	10	33	30.30	Total . . .	87	14	101	13.86	Total . . .	171	40	211	18.96

[1] Compiled by Dr. W. H. Prescott.

TWO CASES OF CHYLOUS URINE.

By Francis H. Williams, M.D.

Chyluria is uncommon in our climate, and for this reason it is well to have all such cases put on record. Of two which have been at the City Hospital one illustrates the more common form, which occurs in patients who have been in warm climates, and the other is a case of the kind which is found in individuals who have never lived in the tropics, and is the rarer variety.

By Professor Cheever's permission, the outline of the first case is copied from the Hospital Record of March 23, 1880: —

Case I. — A ship-captain of New Bedford, 30 years old, and single. The patient formerly lived in the West Indies for ten years, but had not done so during the past eight or nine years. Three years ago he noticed that his urine was of a whitish color, and this condition has continued off and on ever since. At times the urine would become clear, and remain so for two or three months, suddenly becoming white again in the course of a day. At times the urethra became clogged by fibrous clots, which were expelled with difficulty. The examination of the urine showed the presence of minute globules, which were soluble in ether. Nothing else abnormal.

March 30th. Since entrance the patient has had no treatment except a tonic of tincture of chloride of iron.

April 4th. The patient's urine remains about the same. He was given advice by Dr. Cheever, in regard to the mode of future life, the business to follow, etc.

April 5th. Discharged; not relieved.

For the following observations in connection with this case I am indebted to Dr. John T. Bowen, of Boston, by whom the analyses were made with great care: —

A sea-captain who had been in various parts of the world, and was suffering from great debility and exhaustion, passed urine, the chylous character of which was marked, being in appearance the exact counterpart of rich, creamy milk. Under the microscope a drop showed a few blood and indifferent cells, together with a large amount of the granular fat in a state of minute subdivision. On one occasion the field seemed to be filled with large-sized bacteria in rapid motion; but, on more careful examination, I discovered this appearance to be due to the chyle, then in a state of molecular movement.

A quantitative examination of the urine yielded the following results: —

Specific gravity	1021.
Amount urine passed during twenty-four hours	1750 c.c.
Amount phos. acid passed during twenty-four hours	3.570 grammes.
Amount urea passed during twenty-four hours	44.625 grammes.
Amount chlorine passed during twenty-four hours	8.272+ grammes.
Amount fat passed during twenty-four hours	5.226 grammes.
Amount albumen passed during twenty-four hours	2.48 grammes.

On another day.

After dinner.	Evening.
138 c.c. of urine.	182 c.c. of urine.
Specific gravity: 1030.	Specific gravity: 1031.
Amount of fat: 1.50144 grammes.	Amount of fat: 0.69888 grammes.

On a third day.

Before breakfast.

130 c.c. of urine.
Specific gravity: 1024.
Amount of fat: 0.324.

It will be observed in this case that the amount of fat is greatest after dinner and least before breakfast.

Case II. — This is one of non-tropical origin, and, as the patient came only quite recently to the hospital, it will not be possible to give as full an account of the case as more extended observation would permit. The case is published now, that it may be included in this volume of the hospital report.

N. H. G., 44 years old, married, carpenter, born in Boston, one child, 19 years old, came to the out-patient department at the City Hospital, because he had passed milky urine every morning for some months. The first urine passed, after getting out of bed in the morning, is very milky; the next specimen of urine is only slightly so, and the other portions of the twenty-four hours' urine are clear.

On Sunday afternoon, March 10th, directly after a nap from one till five o'clock, the urine passed was chylous, as in the morning. On March 28th, 29th, and 30th there was no milkiness at any time during the twenty-four hours; and since then till April 2d it has been less milky than usual in the morning.

Several specimens of urine have been obtained, and two analyses — one of clear urine passed during the day, and one of the twenty-four hours' urine — were made by Professor E. S. Wood, of the Harvard Medical School, and his report is as follows: —

March 20, 1889.

Analysis of Clear Day Urine.

Color:	Normal.	Specific Gravity:	1027.
Reaction:	Acid.	Amount of Sediment:	Considerable.
Urophaein:	Increased.	Chlorides:	Normal.
Indoxyl:	Normal.	Sulphates:	———
Urea:	Much increased.	E. Phosphates:	Normal.
Uric Acid:	Slightly increased.	Alk. Phosphates:	Normal.
Albumen:	Very slight trace.		
Sugar:	Absent.		
Bile Pigments:	Absent.		

Sediment: Excess of leucocytes and mucous. Little blood: Large excess of cells like those from neck of bladder; calcic oxalate, crystals, partly in aggregations; an occasional cholesterine crystal.

March 18, 1889.

Analysis of Twenty-four Hours' Urine.

Color:	Milky.	Specific Gravity:	1024.
Reaction:	Acid.	Amount of Sediment:	Considerable.
Urophaein:	Increased.	Chlorides:	Normal.
Indoxyl:	Normal.	Sulphates:	———
Urea:	Increased.	E. Phosphates:	Normal.
Uric Acid:	Increased.	Alk. Phosphates:	Normal.
Albumen:	Very slight trace.		
Sugar:	Absent.		
Bile Pigments:	Absent.		

Sediment: Same as clear specimen, except in addition the fat molecules and numerous acid urates of sodium crystals. No cholesterine crystals detected.

These examinations show a concentrated condition of the urine, and a tendency to the deposition of calcic oxalate and acid urates.

There is also evidence of irritation in region of prostate, or neck of bladder.

Total amount of urine, three pints, 1500 c.c.

Urea = 4.1% ; in 24 hours, 61.5 grammes of urea.

The determination of fat, kindly made by Dr. Charles Harrington, gave 0.61% ; in 24 hours, 9.15 grammes of fat.

In more than one specimen of fresh chylous urine the chyle was observed under the microscope in a state of molecular movement.

In appearance the patient is a healthy man, five feet eight inches tall, and weighs one hundred and fifty-five pounds, which has been his weight for years. His father died of "abscess of the breast, which broke inside;" his mother died of phthisis, and two of his sisters, of scarlet fever. He had scarlet fever when four years old, also measles in childhood.

He has never been further south than Virginia, where he was for three years and six months during the war; he enlisted at seventeen. From twelve to sixteen years of age he lived in Michigan; with these exceptions he has always lived in Massachusetts. During his army life he had chronic diarrhœa, — at one time for four weeks, at another for a shorter period. He has been troubled with his present

illness, chyluria, for several months. Six months ago the patient noticed that his urine was dark-red, then yellow, and finally white; but only in the morning. The rest of the day the color was normal. The red color lasted three or four weeks, and then the change gradually took place.

It has been absolutely white or yellowish-white in the morning after rising for two months.

There is no pain on micturition; on one occasion, about a month ago, a "stoppage" took place, lasting two minutes. He has had a sharp pain over the middle of Poupart's ligament, on the right side, lasting half a minute and then disappearing. This was three or four months ago, after a hard day's work. He has not been troubled since, except slightly, with this pain. His habits are regular; takes two or three glasses of gin a week. The appetite is poor; bowels move regularly twice a day; when a desire to have a movement comes on he has to go promptly, or he thinks he would have a fainting spell, and be unable to control the sphincter. He does not think that his strength is impaired; there is no cough, no dyspnœa, no palpitation or vertigo, rarely headache.

On physical examination, with the patient lying down, hepatic dulness was found in the mammary line at the seventh rib; flatness from one inch below this to the lower border of the ribs. On the parasternal line, dulness at the seventh rib; flatness an inch below this. On the axillary line, dulness at the eighth interspace; flatness at the ninth rib. The lower border of the liver was not felt below the ribs. The spleen was not enlarged, and was not felt on palpation. Percussion and auscultation over the thorax gave normal signs, except that vocal resonance was increased on the lower right front.

The heart was normal.

The case is evidently one of non-tropical origin, and probably non-parasitic in character; at least, Dr. W. F. Whitney, who has taken the trouble to examine specimens of the patient's blood, did not find any parasites.

The specimens were drawn by pricking the finger with a

needle at eight o'clock in the evening, and also in the afternoon, between two and three o'clock.

Dr. Tyson states, in an excellent article on Chyluria, "Pepper's System of Medicine," Vol. IV., p. 115, that he knows of but one case of certain North American origin; this one adds a second.

According to Dr. Francotte,[1] chyluria in patients who have never lived in the tropics is independent of all parasitic influences. He reports a case where no filariæ were found either in the blood or in the urine, and where the chylous character was dependent upon the erect posture and moving about; when in the horizontal position the urine was nearly normal. It was also intermittent, coming and going at regular intervals.

The second of the cases here reported resembles this one in that the position assumed by the patient seems also to affect the urine. It is, however, milky after lying down, and clear after walking and exercise.

The causes of chyluria are not well understood; that they are in all cases dependent upon the presence of a parasite in the blood probably cannot be maintained.

The most plausible theory is, that the cause of chyluria is to be found in some anatomical change which permits the mixture of chyle with the urine.

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[1] Chylurine non-parasitaire: Annales de la Société medico-chirurgical de Liège, 1886–25, p. 383.